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## AMERICAN RESISTANT VINES.

PART III.

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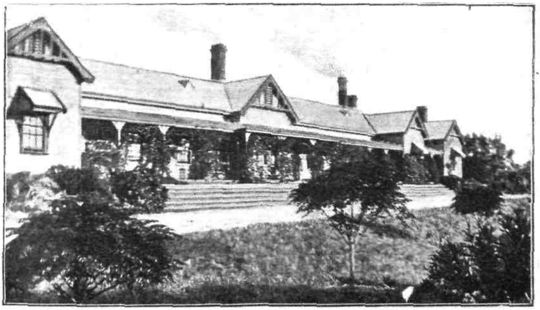
### Hybrids.

A study of the American resistant vines without references to, and descriptions of, the hybrids, would be manifestly incomplete, since to these we are indebted for some of our most valuable stocks. These hybrids



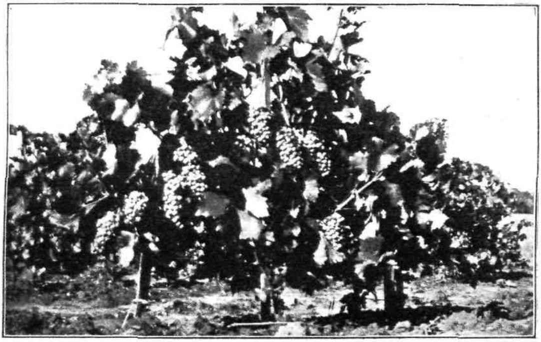
VITICULTURAL COLLEGE, RUTHERGLEN.

may be the result of hybridization between various species of the indigenous American vines, or one parent may be of European and the other of American origin. The former are designated Americo x American, and the latter are known as Franco x American, and include what are called

direct producers. These have not been regarded with much favour here, nor adopted in the Commonwealth, owing to the somewhat limited resistance of the roots to phylloxera, and also to the peculiarities of flavour in the fruit.

One has only to look round a well-equipped garden to realize how much we are indebted to hybridization and selection for many of our choicest flowers, fruits, and vegetables. Much has been recently written in magazines and newspapers regarding the wonderful results obtained along these lines by Mr. Burbank, the "plant wizard" of America. Plant breeding is now an established industry in some parts, and just as animals are mated to secure desired characteristics in the progeny, so hybridizing is practised with plants to secure a desired end.

Every gardener knows that the setting of seed depends on the union of the two essential elements of flowers, sometimes called "male and

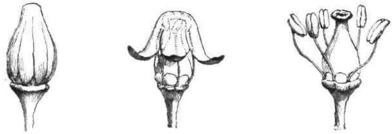


GRAFTED VINE, THREE YEARS FROM BENCH.

female." The golden dust known as pollen must come into contact with the adhesive surface of the stigma. In nature this union is brought about by the agency of the wind or by the visits of insects. Having reached the mature stigma, the pollen grain sends down a tube, which reaches down to the ovary of the flower. In this casket (ovary) are carefully protected the treasures of the plant (ovules), which are destined by means of fertilization to become seeds, and be the means of perpetuating the species. When the pollen tube has reached one of these tiny ovules, a minute body, known as a generative cell, passes down the tube. It comes in contact with specialized cells in the ovule or immature seed. Fertilization or fecundation takes place. The ovule is now transformed into a seed, and after having been allowed to ripen on the plant, will grow under suitable conditions, and produce a plant more or less like that on which it was formed.

A knowledge of the facts thus briefly outlined led up to the plant-breeding experiments now so widely conducted, and various hybrids pos-

sessing a combination of desired qualities have resulted. By utilizing as "parents" two plants possessing certain desirable and well-marked qualities, and "inoculating" the one from the other, we may obtain in the seedlings from the resulting seed, plants that possess one or a combination of the characters exhibited by the parents. Characteristics inherited from some more or less remote ancestor may also appear, and under certain conditions of environment even new characters may manifest themselves.



NORMAL VINE FLOWERS—DIFFERENT STAGES IN OPENING.
*(From Manual of Modern Viticulture (Foex).*

In connexion with hybridization among vines, as among other plants, great care is necessary to prevent other than the desired pollen coming into contact with the stigma. To insure this it is usual to remove the stamens from the parent plant on whose stigma it is desired to experiment, and also to take precautions to prevent foreign pollen being introduced by insect agency, or by means of the wind. Emasculation (as it is called) is a somewhat delicate operation in a flower so small and so peculiar in construction as that of the vine, whose petals remain joined at the apex instead of at the base, as in the case of most other plants. Special instruments are used,

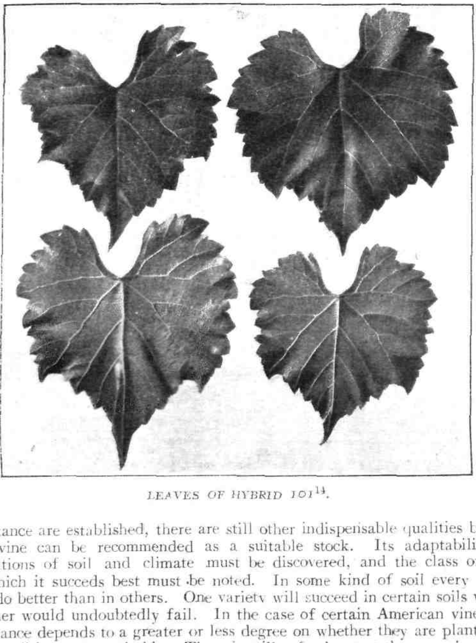
SPRAY OF HYBRID 3306.

and having carefully removed the anthers (pollen cells) before any pollen has escaped, it is necessary to take ripe pollen from the other selected parent plant and place it on the stigma of the flower thus prepared as soon as it is ready to receive it. This may be done by shaking the ripe anthers over the stigmatic surface, or by transferring the pollen to its destination with a fine camel-hair brush. The stigma thus pollinated must be amply protected from adverse weather or insect visits, for in the cold or wet weather the pollen may be either removed or injured, while if insects are allowed access, foreign pollen is sure to be brought, and so nullify the result.

Early in the economic history of the American resistant stocks it was seen desirable to overcome certain difficulties of adaptability, affinity, &c.,

of certain species. Imbued with the necessity and importance of this, a number of well-known viticulturists in France and elsewhere set to work to improve the varieties already known by hybridizing and subsequent selection.

Seeds from the hybridized flowers were sown, and in due time seedlings were obtained. These, while showing resemblances to one or both parents, also exhibit an immense amount of variation. A vigorous habit is a *sine quâ non*, and, consequently, all that do not possess this quality are eliminated. Resistance to phylloxera is the quality for which these vines are required, hence this has to be proved beyond doubt. When its vigour and

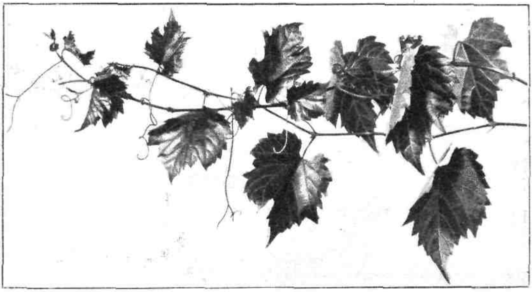


LEAVES OF HYBRID $101^{14}$.

resistance are established, there are still other indispensable qualities before our vine can be recommended as a suitable stock. Its adaptability to conditions of soil and climate must be discovered, and the class of soil in which it succeds best must be noted. In some kind of soil every plant will do better than in others. One variety will succeed in certain soils where another would undoubtedly fail. In the case of certain American vines the resistance depends to a greater or less degree on whether they are planted in the conditions most suitable. There is still a further test that our vine must undergo, viz., that of ascertaining its grafting affinity. Certain scions will join well on one stock, indifferently on another, and even completely fail on a third, hence it is essential to find out the stock and scion best adapted for one another. Then, having found out the most vigorous and most

resistant stock, and having demonstrated the conditions of soil and climate, and what kinds of scion are most suitable, we have some data ready for our work of reconstitution.

Since 1899 the writer has, through evil report and good report, made a most careful study of resistant stocks under all the conditions of our varied viticultural areas, and if asked what varieties are the best all-round stocks for reconstitution, would unhesitatingly name some of the hybrids, particularly those raised by Couderc from hybridization of Riparia and Rupestris, and designated by the Nos. 3306 and 3309. Former articles descriptive of plants of both parent strains have shown their distinctive root systems. The hybrids combine in the one plant the root systems of both. This enables these plants to adapt themselves most readily to the conditions suitable to either parent stock. They are, in addition, vigorous in habit and excellent graft-bearers, while their resistance to phylloxera is the highest known. Hybrid No. $101^{14}$ of Millardet and de Grasset



SPRAY OF SOLONIS.

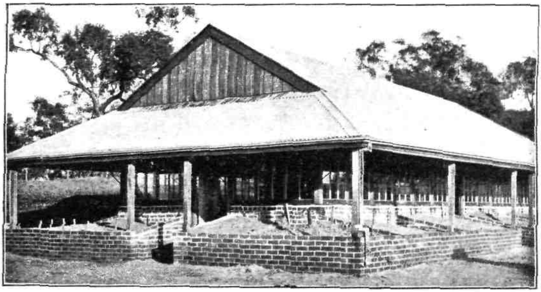
combines also the good qualities of the same parents. It is an exceptionally vigorous and useful stock, and is reported from California as doing well in limestone soils which American vines do not, as a rule, take kindly to.

Among Franco-American hybrids we usually gain in grafting affinity, owing to the European strain in the stock. Among the more meritorious of these are Aramon x Rupestris Ganzin and Mourvèdre x Rupestris No. 1202. The latter has the merit of adapting itself more readily to scions of the Muscat group than most of the American stocks.

Solonis, another stock of considerable merit, is regarded by Millardet as a ternary hybrid of Candicans x Riparia x Rupestris, while Mazade considers the European vine is also represented in the strain. Under ordinary conditions of soil it is greatly excelled by other stocks of a much higher resistance, but has the merit of being the only resistant stock adapted for alkaline or salty soils and wet situations, where its resistance —though not equal to that of the other hybrids already discussed—is yet quite sufficient for safety. In ill-drained soils it will thrive better than any other American stock, and it is not so susceptible to pourridie (root-rot) as most others.

A few other hybrids, including some of more than ordinary promise, are also cultivated, but those mentioned are the principal strains used.

The accompanying illustration represents the grafting shed recently erected by the Department of Agriculture at the Viticultural College to cope with the rapidly increasing demand for grafted vines. The building was designed by, and built under the supervision of, the writer. The dimensions are 60 x 30 feet, and the main building is surrounded by brick stratifying frames for stocks and scions. All round, at the height of the benches, are sashes 3 ft. 6 in. high, which provide ample light for the operators. Besides the men employed, twenty boys are being carefully trained in this important work. It is confidently anticipated that when a full supply of "wood" for stocks is secured, there will be no difficulty in meeting all demands for grafted vines, and that the reconstitution of vineyards in phylloxerated areas will be rapidly accomplished.



GRAFTING SHED, VITICULTURAL COLLEGE, RUTHERGLEN.

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# THE GOOSEBERRY.

*James Lang, Harcourt.*

This fruit succeeds best in the cooler districts of the State, but also does fairly well in many places north of the Dividing Range. It will grow in almost any kind of soil, but a deep sandy loam suits it best.

### PREPARATION OF THE GROUND.

In preparing the land for a gooseberry plantation, see, above all things, that there is good drainage, either naturally, by an open porous sub-soil,

deep and 40 feet apart. There is no plant more impatient of stagnant water at the roots than the gooseberry, and no plantation will be a success unless the land is well drained. Gooseberries do best in a plantation by themselves; many orchardists plant them amongst the fruit trees in the orchard, but this plan is not commendable, as they are in the way when working the orchard, and usually get torn out or broken down when ploughing and scarifying. In preparing the ground for planting, it should be deeply ploughed in the springtime, and allowed to lie fallow through the summer, scarifying it once or twice during the latter. In the autumn, about the month of March, the land should again be deeply ploughed, 8 inches at least, and then the harrow should be run over it to level it down. The ground will then be fit for planting.

### PLANTING.

The plants should be planted in rows 6 feet apart, and 6 feet between the plants in the rows. This will permit of the ground being worked by the plough and horse hoe during the first few years of the plants' growth. Planted at 6 feet apart, it will take 1,201 plants to plant an acre. Do not plant too deeply, as the bushes, when planted, should have a clear stem above the ground of from 6 to 8 inches. If any suckers are attached to the roots, cut them clean out with a sharp knife, in order to prevent them from suckering again.

The after-cultivation of the plants will be the ploughing of the ground in the autumn with a small one-horse plough, when the furrows should be thrown up against the plants, leaving a furrow down the centre of the rows. Let it remain in this state during the winter; in the early spring the furrow should be turned the reverse way, and the strip of ground left in the rows should be levelled into the furrows with a strong hoe, which will leave the ground again level. Stir occasionally with the horse hoe to keep the weeds down and the soil loose.

### PRUNING.

This is one of the most important points in connexion with the cultivation of the gooseberry. Most people imagine that the gooseberry will grow without any care whatever in the way of pruning, but this is a great mistake, as it requires the same careful treatment in pruning as does any fruit tree. It takes quite as long to prune a gooseberry bush properly as it does to prune an ordinary fruit tree. Most of the gooseberry bushes have a pendulous habit of growth, and it should be the aim of the pruner to combat this tendency by cutting the main branches always back to a bud with an upward tendency. In pruning the first season after planting, thin out the branches, leaving three or four to form the main branches of the bush; these should be shortened back to 3 or 4 inches from the stem. The following year all wood should again be cut away, with the exception of the continuation of the main branches; these should be shortened back at least one-half, cutting back to an upward bud. The third year another shoot on the main branches should be left to form a secondary branch, and should be shortened back the same as the main branches; also cut out all the spray shoots from the centre of the bush. The pruning for the fourth and subsequent years will be much the same; as the bush spreads out, more

shoots will have to be left to form branches. See that these are properly spaced at fairly equal distances one from the other, are not too crowded, and that no shoot is crossing another. All young growths from the centre of the bush will have to be kept clear.

If these instructions are followed out, the branches will be lined with fruit from the centre to the extremity, thus facilitating the gathering. Where time is available, an early summer pruning could be given by pinching back all young growths except those wanted to enlarge the bush. In pruning those varieties of gooseberries with a strong upward growth, always cut back to an outside bud; in other respects, the pruning will be the same as given above. The gooseberry bush is by no means the short-lived plant many people suppose; if it is properly looked after and cultivated it will live and be profitable for many years. The writer has in his orchard at the present time bushes over 30 years old, which are still bearing heavy crops of fruit of good quality.

### PROPAGATION FROM CUTTINGS.

Gooseberries are usually propagated from cuttings. Take strong, young shoots, and cut them into lengths from a foot to 15 inches long. The base of the cutting should be cut clean across just under a bud; then cut out all the buds with the exception of four at the top, as this will prevent the plant from throwing up suckers afterwards. Plant the cuttings in rows 2 feet apart, and 6 inches between the cuttings. They should be put in slanting, leaving the portion with the four buds above the ground. The cuttings should be trodden firmly in, especially at the base. The next year these will be fit for transplanting. In planting out the young plants, any small roots that may have formed high up on the stem should be cleaned off, leaving a clear stem of 8 inches.

### VARIETIES.

The varieties of gooseberries are very numerous, many hundreds being now catalogued. Most of the largest varieties originated in Lancashire, a county which is famed for the size and excellence of its gooseberries. Crown Bob (hairy red) and Roaring Lion are the varieties most favoured by market growers. Winham's Industry (hairy red) is a new variety, which is coming into favour, but, in the opinion of many growers, it is not so good as Crown Bob, which it somewhat resembles. Red Warrington (hairy red), a late variety, is undoubtedly the finest-favoured gooseberry grown, and stands the hot winds without injury; it is not a favourite with growers, on account of its strong, aggressive prickles, yet, notwithstanding this, it ought to be more grown than it is. Ostrich (smooth white), a large, broad-shouldered berry, is also a splendid variety to grow; it is a strong, upright grower, and bears heavy crops of berries of a large size. Whitesmith (long smooth white) is a good grower and prolific bearer. Lord Crewe (round, hairy white) is the earliest gooseberry to ripen. Billy Dean (long smooth red), which is very similar to Roaring Lion, is also good. The following are the largest gooseberries in cultivation:—Dan's Mistake, Red Robin, Clayton, London, red; Leveller, Leader, yellow; Antagonist, Postman, white; Stockwell, green.

# THE WOOL INDUSTRY—SHEARING NOTES.

*W. Haile, Instructor in Wool Sorting and Classing, Working Men's College, Melbourne.*

As the season is now approaching when wool-growers will be making preparations for shearing, I therefore embrace the opportunity to offer a few practical suggestions how clips should be prepared for the market.

It is to be regretted that many sheep-owners do not pay sufficient attention to the "get-up" of their clips; they will pay high prices for rams to improve their flocks, but when shearing is in progress they allow their wool to be "got up" in a slipshod, instead of a scientific, manner. It should be more generally known that the manufacturers instruct their representatives here to purchase at a certain limit wool giving a good percentage of clean wool when scoured, that is, wool that will spin to a required number or quality of top. It therefore follows that if the wool be well and evenly "got up," the grower reaps the full advantage of the value of the clip. On the other hand, if fleeces of various lengths and qualities are pressed into the same bale, the valuing is made more difficult, and a good margin below the real value of some of the fleeces has to be allowed. Manufacturers know to a trifle what return a clip or portion of a clip will give them. One bale of the clip is tested—that is, it is given to a wool-sorter to divide the various qualities; these are weighed to a fraction, each quality is valued, and the result, profit or loss, ascertained. A sample of the clip is taken from another bale, and this, with the result of the trial bale, enables the manufacturer to instruct his representatives or brokers what to give for the same line next season. This accounts for many of our best "got up" clips finding their way to the same consumer annually. Personally, I have handled the same clips for years in England until a change in the breeding, or an alteration in the get-up, has caused certain clips to be boycotted. Therefore, if your wool-classer has placed your wool in the market and obtained a reputation, do not change.

In the get-up of lambs' wool, many sheep-owners do not pay sufficient care. They have valuable wool, which will amply repay them for careful handling and classification. I know several brands of Victorian lambs' wool so well classed that manufacturers use them without re-sorting; the qualities are even, there is no loss from inferior wool, and therefore they can afford to and they do give the highest market value for the same.

It is estimated that about one-third of the sheep in this State is owned by small holders—that is, farmers. This wool is nearly, if not all, sold in the local markets, and, consequently, has to compete with large clips. There are exceptions, and since the introduction of the Agricultural Classes for farmers and farmers' sons, several small well-got-up clip have commanded as much attention from the buyers as large clips. It therefore follows that if the owners of small clips desire to realize the prices paid for large well-got-up ones, they must raise the standard of their wools. To do this, defects in breeding, growth, and general character must be remedied, and more attention paid to the get-up of the wool. In placing any commodity on the market, the article should be made to look as attractive as possible. This principle applies to wool more than any article I know of, and there-

fore it is to the interest of every sheep-owner, no matter how small his clip may be, to carefully get up and place his wool on the market in the most attractive style.

The supervision of the clip must commence with the shearing. A fine day should be selected to commence shearing—a day that has been preceded by several fine days—as it is absolutely necessary that wool be dry when shorn. Any moisture or dampness is easily detected by an expert buyer; the wool has a clammy feel, and the longer it remains in the bale the worse the colour becomes, depreciating its commercial value. Whatever accommodation you have for shearing, see that the floor is perfectly clean; nothing spoils the appearance of wool so much as foreign matter, such as straw, chaff, &c. The floor should be thoroughly washed before shearing commences.

It is advisable, even for the farmer, to secure good practical shearers. He should see that each sheep is well and evenly shorn, commencing with the belly wool. The bellies should be detached from the fleece, picked up from the board and kept separately; in wether bellies, all stained pieces should be removed and placed in a bag or basket kept for that purpose. The shearer should open up his sheep in the ordinary manner, avoiding second cuts. If the wool is taken off evenly with the fleece its value is considerably enhanced; on the other hand, wool unevenly shorn is depreciated in value, as a uniform length of staple is much more appreciated by manufacturers.

As soon as a sheep is shorn the fleece should be picked up and thrown on the rollers' table. This table should be large enough to throw an open fleece upon it; many tables are made too small, and, consequently, portions of the fleece fall over the sides, with the result that skirters often tear off some of the most valuable wool of the fleece. The next process is skirting the fleece. In the case of a clean clip, one free from burr and seed, light skirting only is required. With ewes' fleeces the stained pieces should be removed before commencing to skirt a fleece; the stained pieces should be thrown into a basket or box conveniently placed near the end of the table, as this will save the piece-pickers unnecessary work in picking them out again. In skirting light, just take off the edges of the fleece, remove only the short, dirty and straggly wool, work around the shoulder, but do not cut it straight off, as this portion of the fleece is required to show the fleece off to the best advantage when rolled; remove the inferior portion of the breech, and also the shabby portions of the neck. If the back is weak, this should also be taken out and sold separately.

If the clip is seedy or burry, a much deeper skirting is necessary. It will be best to remove the burry portion from the clean wool; all the neck wool that is seedy or sticky should also be removed. See to it that not a staple more than is necessary is removed from the sides and shoulders of the fleece. The fleece is now ready for rolling. This should be done by throwing over the two breeches into the fleece, and turning over the neck as far as the shoulders; then turn in the sides, narrowing the fleece to about eighteen inches. Start rolling up firmly and evenly from the breech; the best portion of the fleece, the shoulders, is then exposed to view, thus giving the fleece its most attractive appearance. If convenient bins are handy, it is not necessary to tie the fleece. Above all things, avoid tying it with string, as many buyers will not look at a clip string-tied.

The skirts should be picked up from the floor—not swept up, as the usual custom is. In sweeping up, the pieces and locks get rolled up to-

gether; this gives considerably more work to the piece-pickers when separating the pieces according to their commercial value. In clean, lightly-skirted clips two sorts of pieces only will be necessary, *i.e.*, first and second pieces. The long, clean, lightly-seeded pieces should be called the first pieces, the short, shabby, yellow-yolky and very seedy pieces should go into the seconds, and the clean wool that generally constitutes *the broken should be left on the fleece. If the owner insists upon deep* skirting, three classes of pieces are necessary, viz., broken, first, and second pieces.

The bellies should have all stained pieces removed. When belly wool is of good length, and can be used for "combing" wool, careful skirting and trimming up would considerably enhance its value.

Whilst this portion of the work is being done under the classer or owner's supervision, the latter is busy classing or grading the fleeces. This should be done in a skilful manner, the object in view being the proper arranging of certain qualities or descriptions, in order to secure the best price for them. To do this efficiently he must study the requirements of the British, American, and Continental markets. As the yield of wool is the most important thing to consider in estimating the true value of the raw material, it will be readily understood how essential it is that the condition of wool in the various classes should be even throughout. Want of attention in this particular often prejudices the sale to a great extent.

In some clips, owing to bad seasons or other causes, a certain portion of the clip may be tender; the staple will be as long as the combing wool, but when tested for strength will break. Many owners place this with *the short or real clothing wool. This should not be done, as all long*-stapled, tender wool should be classed, and sold separately as "tender." All fleeces heavy in yolk and discoloured and rotted fleeces should not be classed with the leading lines, but kept out, and sold separately as "fleece."

The classing of crossbred in most cases shows a lack of knowledge as regards manufacturers' wants. These wools are placed on the market in a most irregular manner as regards quality and length, and in these cases would-be buyers either value according to the lowest-value fleeces or leave the lot severely alone.

These remarks apply not only to large clips, but to small, or farmers', clips. Users of wool are very particular regarding quality, and it would never do to mix several qualities together. *Discrimination should also be* made between high-class or well-bred wool and wool of a mongrel type. Manufacturers are asking that wool should be placed on the market in as even lines as possible, according to the size of the clip. The principal ground of complaint from wool-buyers has been the almost total neglect as to the condition of wool. Heavy, yolky fleeces, that will lose 60 per cent. in the washing, are baled up with lightly-conditioned fleeces that will give nearly that percentage of clean wool. The yield of wool is the most *important thing to consider in estimating its true value. Want of attention* in this particular often prejudices the sale.

To return to the classing of the fleeces; they should be divided into combing and clothing. Combing wool consists of all long-stapled strong wool. All you require to do to test a staple is to take, or rather draw (not pull out), a staple from the fleece. Take each end of it in the thumb and forefinger of each hand, stretch it out and test its strength, and, if strong, put that fleece in your "combing"; if long-stapled and weak, put it in your "*tender*"; *if short, under one and a half inches, place it in your*

"clothing." The combing sorts should be even and true to quality, the staple of each fleece being as near as possible of the same length, strength, and brightness. The number of qualities made depends on the clip itself. If the clip be exceptionally good, three combings, three clothings, and a dingy should be made.

In the combings the great bulk of the clip will constitute the first combing; this should contain the average quality and length of the clip. The super. combing will consist of fleeces a little shorter in staple, but much finer; the second combing contains all the fleeces stronger or coarser than the first combing, of deeper growth, but all sound wool.

In clothing the classes are made according to condition and quality. All short-stapled fleeces constitute the clothing. The super. consists of the highest quality, dense staple, and soft wool with fine serrations, for felting purposes. The first clothing will contain the bulk of this description; although not so fine as the super., it should still be bright, soft, and contain good carding properties. The second clothing is a wider sort, containing all the low-quality fleeces, and any short, rough, and shabby fleeces. These different descriptions should be branded in plain English, such as "Super., first or second."

I am speaking of merino wool now, and before leaving this type of wool I may mention that in some merino clips, where a portion of the clip is of very robust character, the bright, long, strong fleeces are profitably kept out of the second combing, and made into a line by themselves. All mushy, yellow, and inferior fleeces should be kept out, and branded "Dingy."

Lambs' wool should receive as much, or even more attention than the fleece. The lambs' fleeces when shorn should be picked up separately, and placed on the rollers' table. The rollers take the clean portion of the fleece from the skirting and belly wool, and pass the clean wool to the classer's table. If three classes are required, the classer generally prefers to make his own super. and first, at the same time rejecting any skirtings, low and shabby wool, and coarse breeches. The skirtings removed by the rollers are passed on to the piece-pickers, who secure any good wool left in, and also remove all stained pieces. These constitute the second lambs.

*Crossbred and Comeback.*—It is very difficult for buyers to value crossbred and comeback clips up to their intrinsic value, owing to the very irregular manner many clips are placed on the market. There are exceptions, but a large portion of our crossbred clips is placed on the market in a very irregular manner. You will find several grades in quality, long and medium stapled wool, all in the same bale. To value this a buyer must protect himself, and value low. If the clip will admit of good selling lines, classing should be done as near counts as possible, each class of an average quality and length of staple, all short, shabby, and matted fleeces to be kept separate and sold by themselves as "fleece." The highest grade will be a comeback, the next grade a super., the third grade a first X, the fourth a second X, understanding, of course, these lines will be reduced if the quality of wool is not there to make them.

Heavy fleeces, such as Lincoln or Leicester, should be kept separate, and branded accordingly. In lambs each cross should be kept separate if in sufficient quantity. Good length in lambs is a great factor in its value. In small, or farmers', clips, too much sub-dividing is not necessary, but make your lines as even as your clip will permit.

The pressing should be cleanly and carefully done, as an attractive appearance favorably impresses the buyer. One very objectionable practice

with pressers is not paying sufficient attention to the removal of bits of twine from the bale, and allowing them to fall on the floor. Hemp is very destructive to woollen machinery, and it also spoils any wool it gets mixed up with. Brand each bale as soon as pressed with the quality or description of wool contained therein, and sell at current market rates. If the full value is not bid for it, your broker will reserve it for future sale.

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# FOURTH CONVENTION OF THE VICTORIAN CHAMBER OF AGRICULTURE, JULY, 1906.

(*Continued from page* 510.)

## V.—HISTORY OF STOCK DISEASES IN AUSTRALIA.

*W. T. Kendall, M.R.C.V.S., Principal, Melbourne Veterinary College.*

Australia offers a splendid field for the study of many biological problems, not the least important of which is the evolution of disease. Its isolated position and severance from other lands where various progressive and civilizing influences have been going on for ages, has left it far behind in the evolution of species in both the animal and vegetable kingdoms. The native fauna belong to all but extinct species, which renders them all the more interesting, and the platypus, or *ornithorhynchus paradoxus* of scientists, is said to provide a connecting link between the bird and the mammal. The aborigines are only on a level with the neolithic man of a bygone geologic period, whilst many plants are only represented by fossil forms found in other countries.

But little is known of the diseases that may have affected man or animals prior to its occupation by the white race, but it may be safely inferred that they were few and unimportant. With the exception of perhaps some of the common parasitic diseases they could have had but little influence on the imported species. On the other hand, the diseases introduced by the whites, such as measles and small-pox, have had a most disastrous effect on the aborigines, and it is quite probable that the extinction of some of the native animals may be hastened by diseases introduced by imported animals. It is also possible that some of the native species may act as retainers and transmitters of the germs of imported diseases. The domesticated animals introduced by the early settlers readily adapted themselves to their surroundings, and they and their progeny remained practically free from disease for many years; but as time went on one disease after another appeared among them until they can no longer be said to enjoy any special exemption.

Disease being the natural result of adequate causes, the importance of inquiring into their origin and distribution is self-evident. I therefore propose to give in this paper a list of the more important diseases with which the domestic animals in Australia have been assailed, but not having had access to the departmental records of the various States, I cannot be quite positive as to their exact order of sequence. I can, however, well

imagine that the parasitic diseases were first to make their appearance. Parasites are divided into two classes, viz., macroscopic, or those which can be seen by the naked eye, and microscopic, which can only be seen with the aid of a microscope; the former give rise to what are commonly called parasitic diseases, and the latter to so-called germ diseases.

## PARASITIC DISEASES.

These may be caused by external parasites which attack the skin, or internal ones which invade the internal organs and tissues. As already stated, some of these may have been acquired from the native fauna, but the fact that nearly all are identical with those affecting animals in countries whence the original stock was obtained, points to the conclusion that in most instances they have been brought here in or upon their respective hosts. A familiar example of a parasitic disease of the skin is "Scab" in sheep, caused by the *acarus scabei*, and which proved so disastrous to flock owners in the early days. I have not been able to ascertain when it was introduced into the mother State, but have been informed by the Chief Inspector of Stock that it is believed to have been introduced into Victoria with the first shipment of sheep from Tasmania. Mange in horses, cattle, and dogs is due to parasites of the same species, which were probably introduced with their natural hosts.

The same may be said of ticks, lice, ring-worm, &c. The Queensland tick, which causes the fatal "Tick Fever," is said to have been introduced with the buffalo from India, and the fowl tick with fowls imported from the United States. The "Bot Fly" of the horse and sheep, and the "Blow Fly" of sheep appear to have been comparatively recent importations. Up till about fifteen years ago I had not seen a single "bot" in a horse's stomach, although I had made scores of *post-mortem* examinations for them, and now it is rare to find a horse without "bots."

The internal parasites are divided into three classes, viz., round, ribbon-shaped and flat worms, or, to use the scientific terms, nematodes, cestodes and trematodes. The round worms chiefly attack the intestines and lungs, and seem to have given trouble amongst sheep for a long time, more particularly in certain localities and during certain seasons. A dry season following a wet one, especially when feed is scarce, greatly favours a parasitic invasion. Young horses, cattle, pigs, and dogs have also their share of worm diseases, the mortality caused sometimes being very great. Tapeworms in some seasons have caused great mortality in lambs. Hydatids, which are the larval forms of tapeworms, are very common in the viscera of sheep, cattle, swine, horses, rabbits, and kangaroos, &c., but seldom cause any serious harm until they reach their ultimate host amongst the carnivora or omnivora. Flukes are common enough in both sheep and cattle, and while well known to be injurious to the former, seldom do much harm to the latter. The surface water holes, ponds, and swamps act as the chief propagating and distributing centres of the ova or larvæ of all forms of parasites, especially when the water gets low in dry seasons.

## INFECTIVE OR GERM DISEASES.

The first serious outbreak of disease that I have seen any record of occurred in New South Wales in 1834. This is described as Malignant Catarrh, and there seems a strong probability that it was an infective and fatal form of pneumonia, due to some local cause. In 1847, Anthrax, or, as it was then called, "Cumberland Disease," made its appearance on the

Leppington Estate, near Campbelltown, New South Wales, and from there spread to the Murray and Lower Murrumbidgee, and on to the Darling Downs. In a letter written to the late Mr. Graham Mitchell, F.R.C.V.S., by the Chief Inspector of Stock, Queensland, dated 18th March, 1877, it is stated that a telegram had just been received saying that sheep were dying at the rate of twenty a night of Cumberland Disease, at Merino, on the New South Wales border. In 1876 the first extensive outbreak in Victoria occurred in the Western District, and hundreds of sheep were found dead in the camps. Since then millions of sheep have died of this disease, and many squatters, especially in New South Wales, have been ruined by their losses. Cattle, horses, and swine have also been victims, and not a few human beings, through skinning or handling the products of animals that have died of Anthrax.

How or when the disease was first introduced is not known, but, when investigating the cause of an outbreak in a dairy herd near Geelong some years ago, I expressed the opinion that it had been introduced by bone meal which had been given to the cattle to prevent "cripples." I took a sample of the meal to Dr. Cherry, who was then doing the bacteriological work at the University, and he confirmed the conjecture I had formed by making cultures of Anthrax bacilli from the meal. My colleague, Mr. S. S. Cameron, M.R.C.V.S., traced the bone meal to a shipment of bones that had arrived from India a little time before. Two other outbreaks occurred in the Dandenong district through using bone meal from the same source.

In 1858, Contagious Pleuro-pneumonia was imported into Victoria by a cow which was diseased when landed, and died within six weeks, having meanwhile infected the owner's herd. The disease was diagnosed by the late Mr. Henry Wragge, M.R.C.V.S., and had his advice—to immediately destroy the whole herd—been acted on without delay, Australia might yet have been free from it. Delay resulted in the disease being spread throughout the whole Commonwealth, and the losses have been enormous.

How or when Tuberculosis was introduced is unknown; probably some of the early importations of pedigree Shorthorns were responsible. This highly specialized breed has been exceedingly prone to the disease, on account of inbreeding and excessive pampering. Having experimentally produced the disease in an otherwise healthy animal by inoculating it with pleuro virus obtained from a beast affected with both Tuberculosis and Pleuro-pneumonia, I am convinced that the disease was largely spread by inoculating for the prevention of pleuro-pneumonia with tubercle-tainted virus. Shortly after my arrival here in 1880 I discovered that 25 per cent. of the cattle slaughtered at the Sandridge Bend Abattoirs were affected with tuberculosis, that there was no inspection, and that all the diseased meat was being sold for human consumption. I reported the state of affairs to the Chief Inspector of Stock, and called the attention of the public press to the matter, the result being the appointment of a Royal Commission in 1884 to inquire into the matter. Since then inspection has been adopted, and the disease has been greatly reduced.

In 1872 an outbreak of Foot and Mouth Disease as reported by the late Mr. Graham Mitchell as having appeared in a herd of cattle at the Werribee. The herd was destroyed, and the disease prevented from spreading. Another Royal Commission was appointed to inquire into the origin of the outbreak, and it was alleged to have been introduced by an imported Shorthorn bull.

Twenty-five years ago I read a paper on "The Prevailing Diseases of Stock" before the National Agricultural Society, and exhibited specimens of Actinomycosis or "Lumpy Jaw," and explained the nature of the organisms causing it. How long the disease had existed prior to that I do not know, but there is a strong probability that it is indigenous. When inspecting the dairy herds of the suppliers to the Bacchus Marsh Concentrated Milk Company some years ago, I found a number of cattle with swellings on the sides of the jaws, which, on examination, proved to be caused by accumulations of barley grass seeds. Some of these I was able to remove by hand. In many cases the lining of the mouth was deeply ulcerated, and in others there were distinct actinomycotic growths, showing that the fungus had found a suitable place in which to grow, and had been probably carried there by the seeds of the barley grass. The disease is not readily communicable from animal to animal, and being amenable to treatment, I am opposed to the wholesale slaughter of affected animals.

About twenty years ago Epizoötic Cellulitis, a form of influenza sometimes called "pinkeye," was introduced by an imported stallion and spread throughout the district where he travelled. Fortunately, means were adopted by which it was suppressed. Strangles has existed for many years, and it is probable that the organism causing it was here prior to the introduction of horses.

Swine Fever, pneumo-enteritis in calves, septicœmia hæmorrhagica in sheep and cattle, and fowl cholera are all due to organisms belonging to the same group. How or when they were introduced would be hard to determine. I am of the opinion that swine fever has existed in the Orbost and other districts for over twenty years, and that the theory that the germs of the disease were introduced with the seed maize imported from America is a feasible one. Only a few weeks ago it was announced in the daily press that an outbreak of swine fever in England had been definitely traced to the grain upon which the pigs were being fed having been imported from a fever-infected district on the Continent.

Since the dairying industry began to develop, numerous specific diseases that were seldom heard of before have made their appearance, and are exacting a heavy toll on the dairymen. Black Leg, or Symptomatic Anthrax, in calves has proved a great scourge, and some idea of its prevalence may be gathered when I state from my own knowledge that over 4,000 calves have been vaccinated with Pasteur's black leg vaccine during the past twelve months, and that other vaccines are being used as well. Other infective diseases, such as Contagious Abortion, Mammitis, Epizoötic Ophthalmia, and "Red Water," are also common in cattle, while infective Pneumonia, Petechial Fever, Influenza, Malignant Œdema and Tetanus in horses; Caseous Adenitis, Foot Rot and Cutaneous Abscesses in sheep; Distemper in dogs, and Diphtheria in calves and swine are seldom absent.

Some of the germs producing these diseases may be capable of fulfilling their life history outside the animal body. Others may pass through the bodies of native or imported animals without injuring them in order to complete the cycle of their existence, until some untoward circumstance gives them an opportunity for producing their deadly effects. In whatever way they conduct themselves certain it is that deadly diseases are continually making their appearance, and the best efforts of the bacteriologist, pathologist, and practitioner are needed to keep pace with them.

## NON-INFECTIVE DISEASES.

There are certain non-infective diseases, chiefly of dietetic origin, which simultaneously affect a large number of animals, and this group is of equal importance to the one I have just dealt with, for the reason that they are continually present in some locality or another, and in the aggregate cause probably quite as great loss. It is a well-known fact that when food is scarce or unsuitable, and water bad, stock of all kinds become predisposed to disease. The disastrous effects of long seasons of drought and starvation being to a great extent unavoidable, need not enter into our calculation here. Stopping short of actual starvation, animals when reduced in condition lose their natural resistance to disease, and readily become the victims of parasitic and microbic invasion, and in this circumstance we have the primary cause of many outbreaks of disease.

The immunity from disease in the early days was no doubt due in a great measure to none but healthy stock having been imported and to the constant supply of suitable food and good water. Overstocking, droughts, taking up unsuitable country, careless breeding, and more extensive and perhaps less judicious importation, without inspection or quarantine, soon began to make their impression, and as time went on diseases increased in number and frequency. A further encouragement has been given to disease by the sub-division of the larger grazing areas, and so restricting the choice of food and water, and by the more highly specialized requirements of dairying and agriculture.

I shall not attempt to enumerate or describe more than a few of the more important dietetic diseases. The two principal diseases that were causing the greatest losses amongst horses 25 years ago were the so-called "Nasal Disease" and Stringhalt. The former has all but disappeared, but the latter is still with us, and is affecting quite a number of horses about Yarragon at the present time.

Nasal Disease, or, more correctly speaking, Osteo-malacia, chiefly affected young racing stock when put into training, and its appearance and disappearance may be accounted for in this way: At the time of its greatest prevalence nearly all the hay supply of Melbourne was grown within a few miles of the city, on land which had been cropped continuously for about 40 years without manuring, consequently it was deficient in the necessary nutritive qualities required by the young growing colts when in active training. When hay growing became general further afield, owing to better railway communication, the quality was better, and the disease gradually disappeared. In the Mallee and other wheat-growing districts, when the mares with foals at foot are turned into the paddocks to feed on the young wheat, the foals soon become ricketty on account of the wheat at that stage of growth being deficient in bone-forming material.

Whether Stringhalt can be regarded as a purely dietetic disease is still a doubtful point. The history of each outbreak, as well as of individual cases, and the symptoms which indicate embolism or plugging of the vessels of the affected limbs and of the pulmonary vessels, in some cases point generally to a microbic or parasitic origin, but further investigation and experiment is needed to elucidate its nature and origin, for which the private practitioner has neither the time nor means at his disposal. It may be worth mentioning that the first extensive outbreak with which I had to deal occurred over twenty years ago, at the late Mr. John Cobain's, on the Maffra road. One thing I have noticed in connexion with several out-

breaks, and which may afford a clûe to work upon in any future investigation that may be taken up, is the fact that they were preceded or accompanied by a plague of caterpillars. When I drove from Sale to Mr. Cobain's on the occasion to which I have referred, the footprints of the horses and tracks of the buggy wheels were left on the road by the crushed caterpillars.

Some years ago I was assisted by Mr. Cameron in conducting a series of experiments to try and ascertain the cause of nearly all the horses going blind on several runs in New South Wales. We made several *post-mortem* examinations of the affected horses, and conducted feeding experiments on healthy ones. Though not absolutely conclusive, the results pointed to the blindness having been caused through the horses having eaten the wild tobacco plant, which the late Baron Von Mueller identified as the "*Nicotiana Sauviolens*," that was found growing in abundance on all the stations where the disease existed.

Throughout the coastal districts of Victoria, South and Western Australia young cattle suffer from a form of "Ricketts," known as "Coast Disease." This is caused by feeding on the poor indigestible, innutritious grasses which grow in these districts. On changing to a good inland pasture they soon recover. In many dairying centres the milking cows suffer from "Cripples," due to poor feed and the heavy drain of milking. Others from similar causes become affected with paralysis and die. In some cases hundreds of cattle are lost from this cause. The bone-chewing habit is indicative of soil deficient in available phosphoric acid and lime, and often leads to fatal consequences.

Many deaths occur from eating dead rabbits, but the cause of death is not phosphorus or arsenical poisoning, as some imagine, but pyæmia, or septicæmia, through getting inoculated with the germ-tainted bones. Many cases of cryptogamic poisoning occur from taking in the spores of fungi with the food, whilst plant poisoning is by no means rare. Old dry kangaroo grass and other grasses cause impaction of the rumen with fatal consequences. Numbers of animals also die from mineral poisoning in the neighbourhood of smelting works through the herbage becoming tainted with condensed fumes from the furnaces.

## UNCLASSIFIED DISEASES.

Another group of diseases embraces those whose origin and character have not yet been scientifically investigated, and which go under the general name of "Mysterious Diseases." They are so numerous and varied that I shall not attempt to catalogue them here. Perhaps it will be thought that my list is already long enough, but I must crave your indulgence a little longer in order to state that there is yet another group which, so far as the every-day work of veterinary surgeons is concerned, is of more importance than any of those already mentioned. I refer to those sporadic forms of disease and casualties which affect individual animals, and in the treatment of which veterinary surgeons are mostly occupied, and out of which their livelihood is obtained. That this is a large and increasing quantity may be gathered from the fact that 25 years ago there were only four qualified veterinary surgeons, including myself, to do the work throughout the whole metropolitan area, besides a considerable amount of up-country work. On looking over the veterinary list published last January, I find there are now 40 practising in Melbourne and suburbs, and

yet I have no hesitation in saying that not more than 50 per cent. of the cases that need veterinary attention throughout this area receive it.

In the discussion that followed the reading of my paper before the National Agricultural Society, a quarter of a century ago, one gentleman stated that there was no disease amongst stock worth mentioning, and that veterinary surgeons were only alarmists and could be very well done without. My reply was that, unless the ordinary laws of nature were reversed in this country, the number of diseases would go on increasing, and that a day would come when stock-owners would be glad to have the aid of the veterinary surgeon, and something, I thought, should be done to prevent the spread of diseases.

What I wish to more particularly emphasize is the fact that a large number of epizoötic and enzootic diseases, affecting all kinds of stock and causing serious losses to owners, receive little or no attention at the hands of the practising veterinary surgeons, most of whom are centred in the metropolis or large provincial towns and cities, and that they come more within the domain of preventive medicine and should be dealt with by the departmental veterinary officers.

It is gratifying to know that Mr. S. S. Cameron, than whom no better man could have been obtained for the position, has been appointed Chief Veterinary Officer to the Department of Agriculture, and that other appointments are to follow, and I venture to predict that the advantages of establishing a veterinary staff which have long been recognised in other countries, will soon be felt and duly appreciated here.

Fortunately, science has kept pace with a number of diseases. Scab in sheep was stamped out by practical methods long ago. Pleuro-pneumonia is kept under control by quarantining and preventive inoculation. Anthrax and Black Leg are now restricted by preventive vaccines, and if Professor Behring's "bovovaccine" proves to be as efficient as is claimed, we are within measurable distance of stamping out Tuberculosis. A fuller knowledge of the life history of both micro and macro parasites will place the diseases which they respectively give rise to more under control, whilst the unclassified diseases will no doubt be more effectively dealt with when their nature and causes have been properly investigated.

The necessity for an institute of Veterinary Research, such as suggested in a very able and comprehensive article of Dr. J. W. Barrett in the *Argus* of 19th June, is beyond question, and there is ample work for a number of highly-trained veterinarians as departmental inspectors and laboratory experts, as well as general practitioners. The establishment of a degree in agriculture in connexion with the University is a step in the right direction, and the fact that veterinary science will form an important subject in the curriculum of study for that degree will help those who will eventually take the lead in scientific agriculture to a better understanding of the laws which govern the origin and dissemination of animal diseases. Draining damp soils, manuring and cultivating the poorer soils, growing suitable crops to tide over seasons of scarcity, and providing a better water supply, will all tend to place the animals under more suitable conditions, while a knowledge of anatomy, physiology, and hygiene should lead to the selection of sounder stock and the maintenance of a higher standard of health.

From the remarks made by the Hon. the Premier in his Brighton speech it is evident that he fully realizes the importance of conserving the health

of our live stock which forms the largest and most valuable of our assets, and that the Government intends to establish a Veterinary College. When I undertook the establishment of the existing institution, the principal object I had in view was to prove the necessity of teaching veterinary science to young Australians, and, although it has taken much longer to accomplish than I anticipated, no one is more gratified than myself to find that the State is willing to undertake the work.

"Ignorance," says Lord Avebury, "costs more than education," and if there is any department of knowledge to which this is more applicable than another, it is that which deals with the nature, causes, and prevention of animal diseases. I might have produced an array of figures to support the facts I have embodied in this paper and shown that an insignificant fraction of the money lost through preventible diseases would have been sufficient to establish and maintain one of the finest veterinary colleges in the world, but I am quite sure that no further argument is needed to convince you of the wisdom of making a higher standard of veterinary education available than it is possible for any private institution to provide, and of establishing University degrees in Veterinary Medicine and Surgery.

Not only should the new institution be a school of veterinary science, but also of comparative pathology, for there are many pathological problems connected with human, as well as veterinary, medicine, that need elucidation. Vegetable pathology, too, dealing as it does with the diseases of plants upon which all animals, either directly or indirectly, subsist, is scarcely less important. Many animal diseases are known to be due to eating diseased plants, and, as our knowledge of etiology increases, no doubt the inter-relationship will be found to extend. Whatever form the proposed institution may take, there can be no question as to the great advantage of a number of specialists in various departments of science working together with the common object of ameliorating the condition of human and animal life, and we may rest assured that the Hon. the Minister of Agriculture, who is doing everything he can to help the great producing interest of this State, will give the matter his best attention.

If there are still some who think I am looking at the subject from a veterinary stand-point only, let me point out that, compared with the stock-owner's, the veterinary surgeon's pecuniary interest is not worth mentioning. No veterinary surgeon has ever made a fortune—very few a competence, and the great majority only a hard-earned living. What we do claim is, that from the circumstances in which we are placed and our daily contact with those who suffer the greatest losses, we are in a position to speak with some authority on a subject which is of vital importance to the future welfare of this great continent, and if our advocacy—for a better recognition of the aid we are capable of giving—has made us appear somewhat self-assertive, I hope you will believe me when I say that our motives have been honest, and that our statements and convictions have always been sincere and capable of verification.

In conclusion, I wish to express my appreciation of the consistent support the members of the Chamber of Agriculture, ever since its inception, has given to every movement for the advancement of veterinary science, and to thank you for the patient hearing you have given me. Let us each take to heart the advice of Milton, who says:

"Accuse not Nature,
She hath done her part, do thou but thine."

## VI. SYSTEMATIC DAIRYING.

*R. Crowe, Superintendent of Exports.*

The direction in which the greatest scope exists for improvement in our dairying methods appears to me to lie at the very root of our practice. Content hitherto with mere rule-of-thumb routine, and relying mainly on vaguely general results for their guidance, dairymen must now be induced to realize that accurate records, without which definite comparisons are impossible, are absolutely essential to a proper systematization of their work, and the rapid and permanent progress of the industry.

One of my first papers on dairying enforced the utility of individual records, and, although this same information has been published from time to time in different forms, and referred to by me at length in a previous address at your first Convention, held at Shepparton, its importance compels me to briefly touch upon it again. You will remember the monthly charts I suggested, with spaces along the top for the names of cows, and down the left-hand margin for each day of the month, with extended lines providing a space for the entry of the morning and evening's milk in lbs. weight. As they are now issued by the Department of Agriculture at nominal cost—only 6d. per dozen—and as one lasts a month, the outlay being thus only 6d. per year, there can be no obstacle whatever in the way of their adoption.

Were this system carried out, the slightest variation in the yield of every member of the herd could be seen at a glance, and should the quantity diminish the cause and its remedy would naturally suggest themselves; if due to a spell of cold weather, the best means of supplying shelter or rugging would come in quick and natural sequence. Any straw stacks on the farm might be rendered accessible, strips of hedges or clumps of trees planted, or shelter-sheds provided. The constant repetition of the lesson by means of the chart with every cold snap will bring a dairyman to a sense of his duty towards his dairy stock. Again, should the trouble be change or drying-up of pastures, or lack of feed, the extent to which the pocket and stock are affected is emphatically demonstrated. As a matter of course, all defects of management, whatever their origin—the dogging and knocking about or ill-treatment of cows, irregular watering, driving long distances, or keeping the animals too long in the milking yards without food—would be continually under observation. On the other hand, all practices having a beneficial influence would be immediately reflected, the lessons, being as they are not only within the knowledge of the dairyman himself but also under the immediate cognizance of each milker, are so well illustrated and so widely diffused that progress is inevitable.

Although attention has been continually directed to it for the last ten years, it is surprising to find comparatively few dairymen adopting the system regularly. Certainly, it is growing, but there should hardly be an individual claiming to be a practical man who does not religiously follow this plan. From my own experience, I can say that everywhere it has been put in operation the dairymen have been astonished at the re-

sult. The following paragraph is taken from a letter received only last week:—

"Only about six times during the past two years has our weekly herd test fallen below 4.0, whereas it used to get down to 3.4. Even then there was no more milk—actually less. Not only so, but the cows we now have for sale are eagerly sought after by previous buyers in our own locality. This is a good testimony to a system of culling by butter production, and selling cows by what they have actually done. We also send out each year a few young bulls from picked cows. Although we have not got up to the yields on many of the rich dairy farms, we are far above the average, and intend to plug along steadily."

NEW ZEALAND EXPERIENCE.

That Victorian dairymen are not alone in neglecting this important phase of their calling will be seen by the last annual report of the National Dairy Association of the South Island of New Zealand for year ending 31st May, 1906, in which it is stated—"Without doubt our dairy herds continue to deteriorate, and our exports of dairy produce, instead of showing by this time a substantial increase, show a slight decrease, for, even taking into account the fact that the cheese export this year shows a substantial increase, it is not sufficient to balance the shortage in the butter export. . . . . Our total export of dairy produce this year shows a decrease on that of the previous year. The increase each year since 1903 has been but small in proportion to the increased quantity of land and cows used in the dairy industry. We have been paying great attention to the manufacture and marketing of our dairy produce, also to securing reductions in freight, and many other most necessary and useful matters have been carefully attended to; but for years we have neglected the proper breeding and rearing of our young stock, and our herds have deteriorated steadily. Had we for years past attended to these matters properly, our export of dairy produce would have been 30 per cent. greater than it now is. It is quite true that a few dairy farmers have given these matters attention, and many of them have shown the excellent results obtained, and have made them known through the press and at conferences, but such dairymen are in a great minority. . . . . Land values have boomed in many parts, and such land values cannot be maintained with deteriorating dairy herds. A Dane gets as much out of one cow as a New Zealander gets out of two—all the result of breeding and weeding out and proper feeding. . . . . Positively we cannot go on as we are doing. Improvement in our dairy cattle is now imperative. Neglect of this may mean ruin to dairymen and to the industry, in view of higher prices for land and possibly lower prices for our produce."

THE ADVANTAGE OF KEEPING ONLY GOOD COWS.

The statement that a good cow consumes more food than a poor one, although generally believed, has seldom been tested in a scientific manner. Under the heading "Dairy Economics," a few days ago, in the daily newspapers, appeared a paragraph on the advantage of keeping only good cows.

A 120 days' trial has been made by the Agricultural Department of Ontario, with the object of testing the cost of food of a good cow and

a poor cow, giving the profit over the cost of food in each case. The Agent-General has forwarded the particulars of the results, which show that the profits from a good cow are very much greater than the increased cost of food. The results are as follow:—

| Breed. | Cost of Feed. | Profit over Cost of Feed. | £100 worth of Feed sufficient for— | Profit from £100 worth of Feed. |
|---|---|---|---|---|
| | £ *s.* *d.* | £ *s.* *d.* | | £ *s.* *d.* |
| Best Jersey ... ... ... | 6 13 3½ | 10 10 5 | 15 | 159 16 3 |
| Poorest Jersey ... ... | 6 5 11½ | 5 11 3 | 16 | 89 0 0 |
| Difference ... ... | 0 7 4 | 4 19 2 | | 70 16 3 |
| Best Holstein ... ... | 7 12 4½ | 8 11 9 | 13 | 111 12 9 |
| Poorest Holstein ... ... | 7 4 6 | 3 15 1½ | 14 (nearly) | 52 11 9 |
| Difference ... .. | 0 7 10½ | 4 16 7½ | | 59 1 0 |
| Best Shorthorn ... ... | 5 19 0½ | 6 15 8 | 17 | 115 6 4 |
| Poorest Shorthorn ... ... | 5 15 4½ | 0 8 1½ | 17⅓ | 7 1 4 |
| Difference ... ... | 0 3 8 | 6 7 6½ | | 108 5 0 |
| Best Brown Swiss ... .. | 6 19 6½ | 5 15 8½ | 14 | 81 0 6 |
| Poorest Brown Swiss ... | 6 14 2½ | 3 2 3½ | 14 | 43 12 8 |
| Difference ... ... | 0 5 4 | 2 13 5 | | 37 7 10 |

It may be noted that, at the rate quoted, the average cost for feeding the cows for a year would be nearly £20 per head, and the average gross returns would come to £36 15s. 6d. per head on the same basis; but this is not a fair deduction to make. It is referred to in order to show the high standard and cost of feeding adopted in the experiment, and the very high prices realised for the milk. It is a pity that the yields were not supplied, and the basis one that could be properly understood. However, as it was made by the Agricultural Department of Ontario, its reliability is taken for granted, and the lesson I wish to bring out is the principal feature of the table. When milk is sold retail for city supply at upwards of 1s. per gallon, it can be understood that the yields are not abnormal. Many Victorian cows give as good results.

Fifteen cows, such as the best Jersey, could be kept for the same period and under similar conditions on £100 worth of feed, and would yield a profit of £159 16s. 3d., whilst 16 cows, such as the poorest Jersey, would bring in only £89 18s. profit from £100 worth of feed; 13 best Holsteins would bring in a profit of £111 12s. 9d., and 14 of the poorest would return but £52 11s. 9d. profit. Seventeen of the best Shorthorns would show a profit of £115 6s. 4d., and Shorthorns, such as the poorest, would make a profit of only £7 1s. 4d. Fourteen of the best Brown Swiss could be kept, and show a profit of £81 0s. 6d., against the same number similar to the poorest, which would bring in a profit of £43 12s. 8d. In the comparison a most striking lesson appears, viz.—the best Shorthorns were 17 times more profitable than the worst Shorthorns in the competition.

SUGGESTIONS.

Now, my reason for referring to this phase of the matter at such length is to indicate two directions in which the practice of recording yields should be encouraged. In the first place, a herd-book based on yields rather than, or at any rate as well as, on pedigree, should be used. In the second place, prizes should be offered for cows giving the largest yields under normal everyday conditions.

In the first instance, a general register should be opened by some recognised body in the State—either the Royal Agricultural Society or the Department of Agriculture—for, under present circumstances, breeders' clubs, or associations would not serve the purpose. All cows should be eligible for registration on proof being forthcoming that the animal was capable of making, say, not less than 14 lbs. of butter per week. The owner of the cow or cows should be obliged to make formal application for registration, and give full particulars as to breed, age, colour, brands, marks, &c. An official or recognised authority would then be instructed to check the performance of the cow for a specified time, and, if eligible for registration by making more than the specified limit of butter for the period, the details should be entered accordingly. In this way all the respective dairy breeds would be afforded an opportunity of proving their value for dairying purposes, whereas if the matter is left to breeders' associations or clubs some dairy sections of cattle are sure to be unrepresented. The collection and publication of such data would in itself furnish a very much needed class of technical instruction, and the healthy rivalry thus engendered would be a most valuable incentive to progress. In course of time the periods could be extended from weekly to monthly, and eventually to yearly, returns for the different breeds. In my opinion, nothing can be suggested so peculiarly calculated to overcome all deficiencies as a step of this kind.

The other method should be in the nature of group or breed competitions—that is, prizes should be offered for the best group of, say, five dairy cows in the following classes:—Pure-bred Ayrshires, Jerseys, Shorthorns, and cows of any breed, which could be tested on farms at any time during the four dairying months of the year, namely, September, October, November, and December. The competitors might be permitted to choose the months in which their cows may be tested. A small committee of control should be appointed to carry out the arrangements and determine the date on which the respective tests were to be made. For instance, supposing there were 48 entries in the whole State, 12 for each month, the committee could meet in Melbourne and fix the test dates. I believe that if representations were made to the Honorable the Minister of Agriculture he would find a means of carrying out the tests, as the accruing data would be invaluable for instructional purposes. An officer of the dairy staff of the Agricultural Department could conduct the test on the farm, under the supervision of the president or vice-president of the local Agricultural Society, and in the event of either of those officials being interested some independent and reputable local authority. The committee could send an officer at an hour's notice to a certain farm, who would strip the cows, and weigh, sample, and test the milk with the Babcock tester, a duplicate sample being sealed and forwarded to the administrative committee, who should have the right to demand additional tests in the event of any abnormal results being disclosed.

A first prize of £10 and gold medal, a second of £5 and silver aedal, and a third of £3, or an outlay of £20 in prizes for each class, hould be sufficient; and as there should not be more than five classes, aade up of Ayrshires, Jerseys, Shorthorns, and dairy cows of any other reed, in addition to the champion cows, for which a special gold medal nd championship certificate should be offered, £100 would defray the ntire cost for prizes; and, as before mentioned, the data accruing from he tests would more than recoup the trouble and expense involved in arrying them out. In the meantime, before closing this section of my ddress, I would again emphasize the necessity for the general adoption f recording tests as the controlling factor of the dairy farmer's practice. 'he improvement of pastures, the cultivation of fodders, ensilage, rational eeding and treatment, the culling of the herd, the rearing of calves from he best milkers only, and scientific breeding upon sound lines, must necesarily follow.

Through the American Holstein-Freisan register can be traced the erformances of this particular breed of cattle for twenty years. The American Jersey Cattle Club records render the same possible with that reed. In each case the breeds are developed to a marvellous point of perection; yet what do we find in Scotland, the home of the Ayrshire, at he present day? The authorities having control of this famous and xcellent breed specify that the milk vessel should be well tucked up, nd the elevation or outline of the animal should show a perfectly straight ine from the brisket to the back of the udder. To secure this requireaent, breeders are resorting to artificial means, by habitually strapping oards under the cow to support the milk bag, as well as diminishing or iscouraging the milking propensity. A size of teat is also still adhered o that is calculated to confine the milking to girls and boys with small ands only.

Why should a cow be discarded because she has a well-developed dder, with good-sized teats? And yet this is actually what is being done hen utility is ignored, or at least relegated to a secondary position. However, it is not necessary to go all the way to Scotland for an example f breeders breaking away at a tangent. In Victoria many like instances aay be quoted. One in particular comes to mind. Names need not be aentioned, as most of you will recognise the case. A noted breeder of erseys followed up type and pedigree closely for generations, and overooked performances. He was regarded as one of our most successful reeders, but at a sale recently, where many pure descendants of his tock were offered, scarcely a bid was given. What do practical dairymen ant with beautiful little cows, nicely shaped and coloured, regular picures, if they will not give plenty of milk?

Are we to continue following rule of thumb, with occasional crazes r fads, or are we to get right down to bed-rock on sound lines that nsure permanent and steady headway?

## Pigs.

No systematic dairyman is without pigs; they are an essential element o success. The latest statistics regarding live stock in Victoria prove hat the number of dairy cattle showed an increase last year of 17,607, whilst pigs have decreased by 12,396. This is somewhat alarming, as well as discreditable. Although all the other rural industries of the

State are progressing, we find one of the most valuable declining. What is the reason? It must be a want of recognition or due appreciation of the important part that swine should take with the other live stock of the farm. On studying the position in the older dairying countries of the world, we find that pig products form a large proportion of the dairy products exported. There would be some excuse for our present state of affairs if the same conditions prevailed now as fifteen or twenty years ago when we had no means of reaching an export market. In those days every few years farmers limited the supply by knocking the young litters on the head. Such a practice was highly contagious, and was resorted to every two or three years in order to maintain the price at a payable level. Now, however, the markets of the world are available for our pig products in the shape of pork and lard, or bacon and ham, &c.

### FORMER EXPORTS.

So far back as 1893, pork was shipped to Great Britain from Victoria, and since then small parcels have been from time to time exported. Attempts were also made with varying success to ship the cured product in the shape of ham and bacon, but there was a certain amount of risk on account of the goods getting mouldy, and turning green *en route*. Large quantities of salt pork are shipped from certain countries to the British market, but for our purpose no way promises to be so successful as the shipment of frozen pork, and then the pigs may either be sold for consumption in that form or successfully cured after reaching their destination. Some five years ago an experiment was conducted at the Government Cool Stores; the carcasses were placed in the cool store for from six to eight weeks, then were taken out, thawed, and most successfully cured. This led to considerable quantities of frozen pork being shipped to the South African market to be cured on arrival there. Again, in the drought period, large quantities of American frozen pork were landed at Sydney, Brisbane, and Melbourne, and cured for consumption here. In comparison with the importations from abroad, our pigs proved to be better than any secured from elsewhere. You will all remember the carcasses exhibited at the Royal Show some time ago when local pork was shown beside carcasses from America, Holland, and Ireland, the Victorian comparing most favorably with the others.

### ADVICE FROM LONDON.

In a recent report from Mr. Peppard, Inspector of Produce, London, through the Agent-General, the following appears:—

"The frozen pork shipped here from Victoria this season has given entire satisfaction. It met with an exceptionally good market owing to short Irish and continental supplies, and the prices realized must not be taken as representative of a normal season. The average price of frozen pork is from 4d. to 4½d. per lb.

The pork season here extends from September to April, for there is some legend to the effect that we should not buy pork unless there is an "r" in the month.

Pigs can be almost any weight, provided they are meaty, but very fat pigs are not wanted. Pigs weighing between 60 and 90 lbs. are worth about ½d. per lb. more than pigs over 90 lbs., because the latter are only useful for chopping purposes. It is not deemed necessary to

grade, and salesmen do not recommend marking the weights on the different carcasses, as owing to shrinkage on the voyage they would be inaccurate.

The carcasses should be well dressed, and stout wraps used to keep them clean.

The pleura must not be removed, because the meat inspectors have instructions by order of the Royal Commission to immediately condemn any pig from which the pleura has been removed.

Very strict inspection is made of pork on the London market, and carcasses where glands have been opened are not treated with any suspicion, as the authorities here consider it a *sine qua non* that they have been subjected to rigid inspection at time of slaughter.

Some carcasses arrive here without heads, but it is suggested to leave the heads on.

Fire brands should not be used. Ear marking is not objected to, although the label with leaden seal as is used with mutton is preferred.

There is no reason why we should not be able to develop a large and profitable business in the frozen pork trade, as the Berkshire breed, which is most common with us, seems to give the greatest satisfaction on the London market. All that is necessary, in addition to the foregoing, to attain this object is to have more regularity in arrivals."

The following advice on the subject is given by Mr. W. Lane Mitchell:—"The season here runs from September to April, and we cannot do with arrivals until late August.

The best weights here are from 60-90 lbs. Heavy weights run from 90-120 lbs., and bring quite ½d. per lb. less than light weights.

Keep heads and feet on, and leaf in.

Double wrapping is not necessary for this market, a good stout sheep shirt being sufficient.

If it is necessary to have any Government stamp put upon the pigs, please see that the stamp is placed either on the ear or on the skull.

Queensland pigs are much rougher in the skin, and much darker in colour than pigs shipped from Sydney and Melbourne.

The normal value of pigs, 4½d. c.i.f.

Buyers will not accept colonial weights, and there must be the same guarantee as with meat, namely, seller guarantees any loss in weight over 2 per cent. There is not any draft as with mutton or lambs, and only the actual tare of the wraps is allowed.

Quality to be 'good average.'

I think consignments give better results than selling c.i.f."

## VICTORIAN PORK.

The pork exported from Victoria last season realized up to 5¾d. per lb., and the expenses, including killing, freezing, freight, and other charges, are fully covered by 1d., so that the grower was left 4¾d. at this end. When prices are normal, as quoted by Mr. Peppard's report, there should be 3½d. per lb. left for the growers here, or 4d. for the more popular weights. Although 4½d. is reported as the normal price, the actual figures of the last two seasons show an upward tendency; for 1904, the average came out at 4.82d., and for 1905 4.9d. per lb., so that the grower here, if catering for the London market regularly, would have received almost 4d. per lb. for the pork, a much better price than

he could have obtained in Victoria. I know certain bacon factories that occasionally secure their supplies at 3d. per lb.

A photograph of some carcasses recently exported is reproduced on the cover of this number of the *Journal*.

### BRITAIN'S IMPORTS.

The imports of pig products into Great Britain now average upwards of 21 million pounds sterling, whilst the butter imported to the same country is equal to 21½ million pounds sterling, so that from these figures the importance of pig products may be realized. The chief country supplying Great Britain's requirements is Denmark, with 5½ million pounds sterling, and the exports of butter from that little country come to nearly 11 million pounds sterling, so that the pig products are valued at almost half their marvellous butter export. If Victorian dairymen grew pigs in the same proportion to their operations as the Danes do, we should now have an annual export trade of over three-quarters of a million pounds sterling, instead of only £50,000. Dairymen of Victoria, do you realize that in neglecting pigs you are losing some £700,000 per year?

It is evident that there is a lack of interest in the subject, and more attention must be directed to the breeding, rearing, feeding, and management of pigs.

### HISTORY OF THE PIG.

The original wild pigs were very different to the animal as we know him now, they had long noses for the purpose of turning up the ground in search of roots—their chief food supply—and tusks to defend themselves from their enemies. They had good lung capacity, and some were in shape not unlike greyhounds. The original old English pig was a slothful, coarse, hairy, repulsive looking animal, and it was not until early in the nineteenth century that any material improvement was effected, and now it is justly claimed that far greater improvement has been secured than in any other farm animal.

Lord Western, while travelling in Italy, came across some Neapolitan pigs, which were far superior to anything they had in England. He procured a pair of thoroughbred Neapolitans. This was the beginning of the systematic improvement in English-bred pigs. The cross-bred Neapolitan, Essex, Sussex, and Berkshires had great success at agricultural fairs, but as Lord Western practised in-breeding, his pigs gradually lost size, constitution, and stamina till at the time of his death, in 1844, the Western breed had so deteriorated as to become more ornamental than useful, while the whole district had benefited from the cross. The highly refined Neapolitan breed was of great value to cross with the large, vigorous, English sows, but was not profitable to raise purely for slaughter. Later importations from China were crossed with English pigs, with the result that an impetus was given to pig-raising, and scientific crossing became the order of the day. Nearly every county in England had its own breed of pigs, Cumberland, Yorkshire, Durham, Lancashire, Cheshire, Lincoln, Devonshire, Wiltshire, Norfolk, Sussex, Essex, Herefordshire, Hampshire, and Berkshire; and the merits of the best were eventually recognised. Now the Berkshire breed stands at the head of the list in popular favour throughout the world, the present improved Berkshire being the product of a cross between the Chinese and old English pig. Next come the Yorkshire and Tamworth. For

very many years in Victoria Berkshires have predominated, and as practically no importations have been made recently, the breed is deteriorating, hence better results are secured by crossing with the Tamworth or, better still, with the Yorkshire. In crossing, however, it should be always borne in mind that only pure bred boars should be employed. Some people regard the pig as a low animal, and look down upon him, but it may be pointed out that amongst the most successful exhibitors at the Smithfield shows was H.R.H. the late Prince Consort, who developed what has since been known as the Windsor breed, and who for nine years running figured as a prize winner at the Smithfield show. There was another fashionable breed known as the Prince Albert Sussex. These facts are mentioned with a view to popularizing pig-raising.

BERKSHIRE STORE PIGS.

The aim of breeders has been to obtain a pig that will produce the largest amount of pork for a given quantity of food. As compared with the stomach of cattle or sheep, that of the pig is only about one-fifth in proportion to its live weight. It is therefore evident that the pig requires more concentrated feed than a bullock or sheep, and is not so well adapted to thrive on grass, hay, &c. It might be reasoned from this that as a steer or a sheep can subsist and fatten on less concentrated and less costly food than the pig, that 100 lb. of beef can be produced at less cost than 100 lb. of pork. There are, however, several things to be considered in this connexion. Pigs eat food which can in no other way be utilized, such as the refuse from the house and dairy, small potatoes, unmarketable grain, and grain in the stubble. They are great eaters, and can devour, digest and assimilate more nutriment in a given time in proportion to their size than any other domestic animal. They should always be fed, and it should be recollected that an animal requires a certain amount of nutritive matter merely to sustain life, the actual quantity requisite varying greatly according to the conditions in which it is placed. When kept comfortably warm and quiet less is needed than if the pig is exposed to cold. Another economic aspect that should not be lost sight of by the raiser of pork is that the more compact the pig, the cheaper will it manufacture its food into pork.

## BEST TYPE OF PIG.

You are all aware that a sphere possesses greater holding capacity in proportion to its exposed surface than a cube of like diameter, and a cube more than an oblong of similar surface. So it is with pigs. The compact pig presents less area for radiation than his longer brother of the same weight—in other words, less food is required to keep up animal heat. This contention does not, I know, coincide with the opinions of pig fanciers of the present day. They prefer a long beast; but a little reflection should convince them that the shorter pig ought to be the better, not only for the reasons already mentioned, but also because the ham—the more valuable part—then forms a greater proportion of the whole weight. The same result has been proved by experience in the case of lambs—a short, nuggety, compact, meaty carcass with short legs, light bone, and the more valuable portion, leg of lamb, forming a maximum percentage of the whole weight. Still another point in favour of the short pig is, that in proportion to its weight the bones are smaller. Any one can understand that a bridge with a long span requires to be much heavier to carry a given weight than one of shorter length. So much for breed and shape. Pigs should always be given as much food as they can eat, so that they may grow and be fattened off at the earliest possible moment. As with other animals, so with the pig, it takes a certain amount of food to keep up animal heat, and provide against wear and tear. Let it be assumed that for a given time 100 lbs. of food is necessary to maintain the animal; if an additional 25 lbs. is assimilated, the whole of this will be turned into pork; if it is capable of digesting a further 25 lbs., double the result will be procured on 150 lbs. weight of food than will be obtained from 125 lbs.

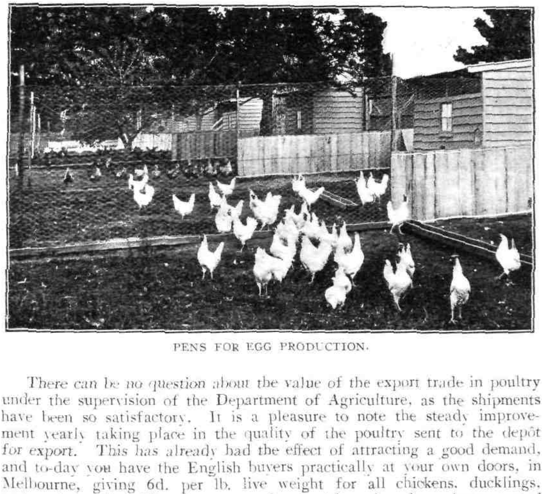
## MODUS OPERANDI.

As already mentioned, the markets of the world are open to growers and exporters. All that is necessary is to communicate with the Agricultural Department, when full particulars and assistance will be afforded. Arrangements can be entered into for slaughtering pigs at either the City Corporation Abattoirs; Mr. Wm. Anderson's, Ascot Vale; Mr. David Mitchell's, Lilydale; or other places. There is no reason why the slaughtering should not also be done in country districts later on, and the carcasses forwarded by rail in meat trucks to the Cool Stores, where handling, freezing, bagging, and shipping are done for a consolidated charge of 9d. per carcass, or 6d. per side, including twenty-one days' storage. Until business connexions are established, the Agent-General is available to hand over consignments to reputable firms for realization on owner's account to best advantage. This, however, is not advised, and shippers are encouraged to make their own business arrangements. Should they not care to do so, there are many agents in Melbourne eager to be negotiated with. Advances on the goods are as readily procurable as they are with butter, there being no difficulty whatever in getting the matter financed. At the present moment certain shipping firms and agents are prepared to advance 4d. per lb. on consignments. It is therefore to be hoped that breeders will grow at least two pigs in the future for every one they have reared in the past. There is ample room for it, and till something of this nature is done they cannot expect to be credited with making the best use of their opportunities.

## VII.—POULTRY AS AN ADJUNCT TO THE FARM *

*A. Hart, Poultry Expert.*

The profitable returns attached to an intelligent system of poultry raising renders this subject one of interest to every farmer in the State. There exists an unlimited market for eggs and poultry in England, which is largely supplied by France, Russia, and America at present; but the fact that these countries can only supply England during the spring and summer months throws open this highly profitable market during the cold weather to the poultry farmers of Victoria. When we consider that England alone paid last year £8,000,000 for poultry and eggs to foreign countries, and that this demand steadily increases, there can be no doubt as to the profitable nature of the business.



PENS FOR EGG PRODUCTION.

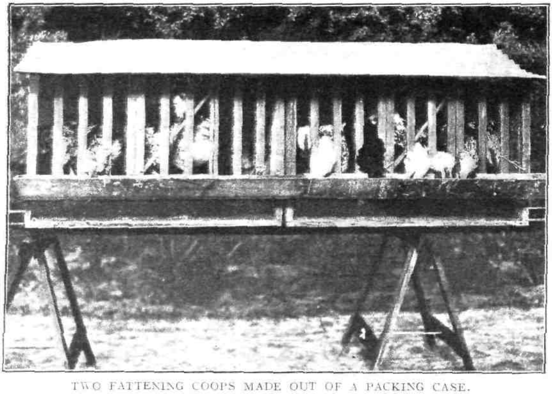
There can be no question about the value of the export trade in poultry under the supervision of the Department of Agriculture, as the shipments have been so satisfactory. It is a pleasure to note the steady improvement yearly taking place in the quality of the poultry sent to the depôt for export. This has already had the effect of attracting a good demand, and to-day you have the English buyers practically at your own doors, in Melbourne, giving 6d. per lb. live weight for all chickens, ducklings, and turkeys that Victoria can produce. After they have been passed by the Government grader at the Cool Stores, the vendor can receive his cheque straight away. Owing to the keen competition for chickens and ducklings for export, the ruling price in the Melbourne market has been from 1s. to 1s. 6d. per pair higher than last year. These facts are mentioned simply to show that there is ample scope for increased attention being given by those who are favorably situated to take part in this interesting and money-making phase of farm life, especially when, with

* Lantern Lecture.

our splendid soil, glorious climate, and cheap feed, our producers have natural advantages second to none in any part of the world. I would recommend every farmer to give his serious attention to this means of increasing his income. As in other pursuits, competition demands an up-to-date knowledge of the industry in all its parts.

### PREPARING CHICKENS FOR THE MARKET AND EXPORT.

All chickens intended for the market should be placed in fattening coops to hold twelve birds. The cockerels must be kept separate from the pullets. The birds should weigh 3 lbs. each when placed in the coop at 12 to 14 weeks' old, and should be of the heavy breeds of fowls. For twenty-one days they should be fed three times daily on the following:—Wheat, heavy Algerian oats, and maize, which should be all crushed fine and mixed together, scalded with skim milk, and mixed



TWO FATTENING COOPS MADE OUT OF A PACKING CASE.

A false bottom, made with 1½-inch mesh wire, is provided. It is raised 3 inches above the floor, to enable the latter to be easily cleaned.

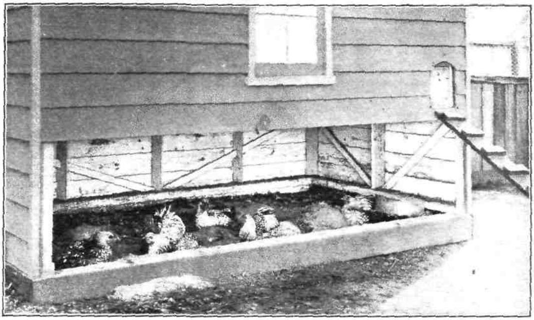
with kitchen scraps, or rendered fat. When fat is used, allow 1 lb. to twenty birds three times a week. All food should be given moist in a crumbly condition, and in cold weather should always be given warm. A liberal supply of grit, wood cinders, and green stuff should be allowed the birds daily. The grit is practically the fowl's teeth, and is required for masticating the food in the bird's gizzard.

To hold twelve birds a coop should measure 6 feet long, 18 inches wide, 20 inches high, and be made of wood, partitioned off in the middle, and all inclosed, with the exception of the front, which is latticed with laths 2½ inches apart to allow the birds to feed and water themselves from a V-shaped trough placed on the outside of the front of the coop. The doors should be made at the back for the purpose of cleaning the coop

and removing the birds. The roof should be made of palings and overhang to prevent the weather beating into the coops when they are in the open. All coops should face the east.

EGG PRODUCTION.

A suitable house for egg production (to hold twenty-five birds) should be 6 feet long, 5 feet wide, and 7 feet high. The floor should be 2 feet from the ground, and the front of the house should be boarded 3 ft. 6 in. from the floor up, with 18 inches of wire netting at the top, and should face the east, with the roof overlapping the front by a foot, so as to prevent the rain beating into the house. The door should be at the back, and slide up for the purpose of cleaning out and letting the inside of the house get the benefit of the afternoon sun. Underneath the floor of the house the space can be used as a dust bath and shelter shed. The yard should be 100 feet x 25 feet.



DUST BATH AND SHELTER.

A dust bath is absolutely necessary in the poultry yard to insure success in keeping down vermin, increasing egg production, and checking disease. It consists of wood ashes, sand, and sulphur or tobacco dust.

An ideal yard for breeding pens or egg production, to hold twelve birds, should be 50 feet x 20 feet. To increase the egg supply, no male bird should be allowed with the hens. The eggs will keep from 7 to 10 days longer in cold weather, and the farmer can regulate his feeding, and see which are his best layers. It is impossible for the most skilful man to get good results from large flocks of birds running together.

An essential to success in poultry is the turning over the ground once or twice in the year. As you are well aware, this sweetens the ground, keeps the fowls healthy, and checks disease.

The fowls' droppings, coupled with the climatic conditions, make the growth so strong that one farmer has to keep twenty breeding ewes for the purpose of keeping down the grass, and they return him £20 per year for lambs and wool.

### SELECTION OF HENS.

Silver Wyandottes are noted for their table properties, but by careful selection and feeding their egg-producing properties have also been developed, and at the Dookie Agricultural College laying competition, just over, they secured premier position with a total of 1,296 eggs. The value of the eggs (six birds) is £4 15s. 7½d., or an average per hen of 15s. 11¼d. Put down the cost of keep at between 4s. and 5s., and you have the very handsome profit of close on 11s. per bird. This stamps the Wyandotte as an all-round utility bird. The eggs shown on the screen (1,296) represent the quantity laid by the six Wyandottes. They were all brown shelled, and their value in the English market is 1½d. to 2d. per dozen more than the white shelled.

White Wyandottes are also a table variety, yet secured second place in the Dookie competition—1,277 eggs, value £4 17s. 0¾d., averaging 16s. 2d. per bird, again showing the importance of breeding and selection.

White Leghorns secured third honours—1,250 eggs, value £4 17s. 4d., averaging 16s. 2½d. per bird. These birds scored owing to being non-setters and good workers, and laying when eggs were dear. These birds were of a good laying strain, and were egg producers, not like a great many of the Leghorns, which are drones on the farm, and do nothing else but make comb and flesh. This goes to show the importance of trap-nesting to build up a good laying strain.

The birds now illustrated are a cross from a Silver Wyandotte rooster and Buff Orpington hens, and they have scored in the export classes wherever shown. Their success has been due to a liberal supply from the cornsack, which goes to prove that more than half the breed goes down the throat. The cross is a good one, whether for producing white legs for table purposes or for egg production.

### FEEDING.

The best morning meal for egg production is two parts pollard, one part bran, one part lucerne chaff, which should be scalded with skim milk or boiling water, and mixed together, and given to the birds in a crumbly condition, and should be placed in a trough or feeding board, and not on the ground. For abundance of eggs, milk or boiled animal food mixed through the mash should be given three times a week when treating birds for egg production only. For the evening meal give grain, consisting of wheat, heavy Algerian oats, and maize, the last being used in winter months only, and then sparingly. The best grain is always the cheapest in the end.

### ECONOMY IN WATERING POULTRY YARDS.

As you can see on the screen, the tank consists of a 10-feet sheet of iron curved to a circle, and is erected on a staging about 6 feet high. A water service is laid from it by means of old gas-piping and cheap low-pressure taps all over the yards. By the use of the stopcock, you can regulate the supply as required. This greatly saves labour, and keeps the expenses down. The trough is constructed of a piece of spouting soldered at each end, and is about a foot long. This is covered by a kerosene case, with one side off, which faces the south, and serves to protect the water from the rays of the sun.

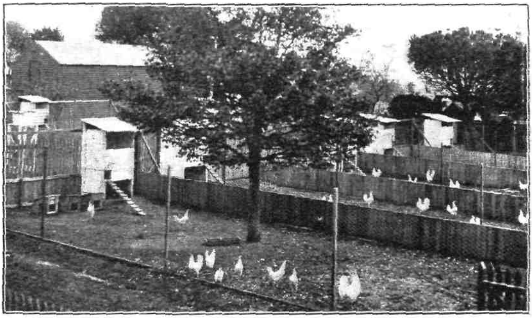
### CHICKEN HOUSING AND FEEDING.

The model chicken coop is so constructed as to protect the chicks from the cold, bleak winds and the rays of the hot sun. It is par-

titioned with small mesh wire to prevent the hen and the sparrows from getting at and eating up any little delicacy that may be given to the chickens during the first month, which is the most critical time of their lives. It is always advisable to place a dry sack under the coop to protect the little ones from the damp grass, and it makes it easier for them to find their food.

A tray for successful chicken feeding is a simple contrivance, and as you can see, prevents the hens from gobbling up the food that you have specially prepared for the chickens. A plain tray, with sparrow proof wire netting on top, and raised from the ground on legs about 3 inches, is placed on a dry sack.

The other view shows you the chickens enjoying their meals whilst the hen is absent foraging on her own. The chickens' meal should consist of—for the first month—coarse oatmeal given dry, kitchen scraps,



BREEDING PENS.

The houses are made out of packing cases, 3 ft. 6 in. x 3 ft. 6 in. x 4 ft.

and bread crumbs, with rape or any greenstuff chopped fine every day. A regular supply of fresh water should be on hand, and the same kept out of the sun.

When soft food is given it should be scalded with milk, and you should add a little fresh-cut green bone twice a week. Before feeding on grain, which should be crushed, the chickens should be supplied with fine grit. Where special feeding is required groats and canary seed are very good for quick maturing young birds.

To encourage young chickens to exercise themselves, and work for their food, a barrow load of dry stable litter or pine needles is the best thing you can give them to scratch in.

Tree lucerne makes the best shelter for poultry yards, and owing to its rapid growth and its feeding properties for poul..y and bees, it is absolutely the best hedge that can be planted. To keep the foliage close to the ground always prune from the top. Thousand headed kale is one of the best green foods for poultry; with the use of a little water, one stalk will renew its green leaves every month after stripping. The plant will last for three years.

*A scratching heap, consisting of stable litter or pine needles, is essential to egg production by making the fowls work for their food. This should be made the feeding place for the grain meal.*

### PROFIT IN EGGS.

All eggs should be gathered at a regular time, say twice a day. Trap-nests will enable the gatherer to know the egg of every hen. This is important when building up a laying strain. The cost of this nest is about 9d., and it is easily constructed, two nests being made out of three kerosene cases.

The gentleman whose picture you see on the screen informed me that his average egg sales in the local market for the past three years were £137 10s. per annum. He keeps six cows for the sole purpose of using the milk for rearing chickens, and for giving to the hens to increase their egg production. The young woman feeding the flock of fowls keeps about 150 head, and her returns from eggs and chickens work out at £26 per year profit after all expenses have been paid, which goes to show the great attention she must have given them, as she was very much handicapped by feeding such a large flock together, and no system being used as regards selection and age. It does not pay to keep a fowl over two years.

### EGGS PACKED FOR EXPORT.

Eggs should be packed for export in odourless cardboard fillers. This prevents the eggs from contracting any taint whatever during their storage in cool chambers, or in transit to the London market. The eggs intended for export should be graded to size and colour, each colour being packed separately. This will allow the purchaser to select the colour he prefers, and result in top prices being obtained—brown eggs commanding 2d. per dozen more than the white. Another important matter is to see that all eggs sent in for export are perfectly fresh and clean. There has been a marked improvement in the uniformity and cleanliness of the eggs consigned to Melbourne for cool storage and local use. There is still room for improvement in this direction; strict attention must be paid to the conditions laid down to insure success of the egg industry. This has been borne out by the results obtained from the various trial shipments sent to London from the Government Cool Stores. The consignments were selected and packed with great care, and arrived in excellent condition, being in every way suitable to the requirements of the trade. They were placed on the market in direct competition with fresh eggs, and realized from 1s. to 1s. 2d. per dozen. At the time those eggs were shipped the local market was glutted, and prices were 5d. to 6d. per dozen.

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## CORRECTION.

*Re* Mr. Crowe's article on "Systematic Dairying," page 533 of this issue of the *Journal*. Since the first half of the *Journal* went to press, final account sales for pork have come to hand. They show that insurance, exchange, stamps, warehousing, cartage, and dock charges on the consignment, coupled with the expenses referred to in the article (page 539), bring the total deductions to 1.37d. per lb. It may be pointed out that, when selling locally, market dues and 5 per cent. commission have to be paid, as compared with 3½ per cent. brokerage and commission in London; therefore the cost of marketing in London amounts to about 1.07d. per lb.

## VIII.—RECONSTITUTION OF VINEYARDS.

*Francois de Castella, Château Dookie, Dookie.*

The subject of this paper is one which can, I fear, only be of practical interest to a limited number of my present audience, for only a few of you are vine-growers, or interested directly in viticulture. When I received the invitation of the Chamber of Agriculture to read a paper on "Viticulture," before the present convention, I had no hesitation as to the selection of my subject, for the question of the reconstitution of our vineyards on phylloxera resistant stocks is the one which at the present time overshadows all others in the minds of our vine-growers.

Viticulture in Victoria has reached a critical period in its history, owing to the recent rapid spread of phylloxera. This pest has now most firmly established itself throughout our vineyards, and its ravages will, within the next few years, lead to a considerable reduction in the wine production of this State. Though checked by efforts at extermination as futile as they were costly, at the time of its first appearance at Geelong in 1875, after a few years it re-appeared at Bendigo, then one of our leading viticultural centres, though the ravages of the insect have practically exterminated it as such. Mooroopna was next attacked, and but for the good work of some of its growers, who deserve credit as pioneers of reconstitution in Australia it would no longer produce wine. More recently still, Rutherglen, the chief stronghold of Victorian viticulture, has been invaded, and is now engaged in a life and death struggle, a struggle which can have but one termination, namely, the destruction of all vines growing on European roots. Protection by insecticide treatment is far too costly to be practicable, and in all districts where phylloxera has made its appearance, it will henceforth only be possible to obtain grapes from vines possessing a root system capable of resisting the insect.

Since we cannot hope to exterminate phylloxera, we must make up our minds to live with it, and to produce grapes in spite of it. We must replace our present vines by resistant ones. This transformation, known as reconstitution, has already been effected in the majority of European vineyards, especially in warm climates, such as Southern France, Spain, Italy, and Portugal, and in the cooler parts where the spread of phylloxera is less rapid, wine-growers are now actively engaged at the same task. In the vast majority of cases the vines eradicated are replaced by grafted ones, a resistant American constituting the stock upon which is grafted a European variety of proved value.

### GRAFTED VINES OR DIRECT PRODUCERS?

The fruit of American vines is unfortunately unfit for wine-making purposes; otherwise the problem of reconstitution would be far simpler than it is. Will a perfect "direct producer" ever be raised? Time alone can tell. The results achieved so far, do not inspire much confidence, especially in the direction of the quality of the resulting wine. The best wine made from these new hybrids compares unfavourably with that made from American stocks grafted with even the commoner European sorts. The question has not yet been advanced to a stage which can practically interest Australian vine-growers. Our hope for the future must be centred

in the use of American stocks of proved resistance grafted with the old cepages of Europe.

We must avoid being led away by dreams of reconstitution without grafting, no matter how seductive they may be. It is only by grafting them on to resistant stocks that it will be possible for us to continue the cultivation of these old varieties, the result of the selection of centuries, from which we have in the past produced wine Australians have every reason to be proud of, and this without sacrificing quality in the slightest degree, for it is clearly demonstrated that the fact of their being grafted on roots not their own, leads to no deterioration in the quality of the fruit. The above does not only apply to the wine maker. The safety of growers of raisins, currants, and table grapes also lies in grafting on resistant stocks. Gordos, Zantes, and the choice table varieties all belong to the species *vinifera*, and are just as susceptible to phylloxera as the sorts grown for wine.

Ever since 1876, when it was first proved that the root systems of the American species of *vitis* did not suffer from the presence of phylloxera, French growers have been on the look out for a direct producer, in other words, for a vine capable of resisting phylloxera and of yielding grapes fit to be converted into wine. The discovery of such a vine would, by doing away with the necessity for grafting, enormously simplify matters.

The majority of the American species hybridize freely with European varieties (all of which belong to one species, *vinifera*), and for the past thirty years many leading scientists and practical men, both in Europe and America, have devoted their best efforts to the raising of a hybrid, combining the resistance to phylloxera of the American parent with the quality and abundance of fruit of the European parent. Many thousands of such hybrids have been raised; a good many have been put on the market, and a few are now more or less extensively cultivated with fairly satisfactory results in the cheap wine districts of France.

Considerable progress has no doubt been made, but though the enthusiasm of those who have devoted their life's work to the obtaining of the ideal "direct producer" cannot fail to command our admiration, the success achieved is, as yet, by no means complete. Resistance and quality of fruit seem to be decidedly antagonistic, and in order to secure the one, the other must be, to some extent, sacrificed.

### RECONSTITUTION IN APPLE CULTURE.

It is now many years since the woolly aphis, an insect belonging to the same family as phylloxera, first compelled apple-growers to work their trees on resistant or blight-proof stocks. No apples are now planted unless rendered secure in this way; the case is almost similar to what we find necessary in viticulture. Reconstitution of our apple orchards has been an unqualified success, no one now troubles himself much about the presence of the once redoubtable American blight. This success in the case of the sister industry is no doubt most reassuring, but we must not lose sight of the fact that the question is considerably more complicated in the case of the vine than in that of the apple. 1st. Apples have always been chiefly grafted, whereas vines were almost invariably propagated by cuttings and consequently grown ungrafted or on their own roots. Grafting was no innovation for the orchadist, nor was it so serious a matter for him owing to the smaller number of trees planted per acre. 2nd. The blight-proof apples used as stocks belong to the same species as the scions grafted on

them, whereas resistant vines belong to species other than *vinifera*, to which, as already mentioned, all European vines belong. It is a well-known fact that the closer the botanical relationship between stock and scion, the better the affinity and the nearer are the conditions of the grafted plant to those of one growing on its own roots, consequently the greater its vitality and the longer its life. For example, a pear grafted on to a seedling pear lives longer and forms a larger and more healthy tree than a pear grafted on a quince or on a hawthorn stock. 3rd. In the case of the apple, the choice of blight-proof stocks is limited. Mr. French mentions twenty in his *Handbook of the Destructive Insects of Victoria*, and of these one alone—the Northern Spy—is more generally used than any other. It seems to thrive in all soils suitable for apple culture, and, when grafted on it, the usual varieties of apple seem to give equally satisfactory results. The vine-grower, on the other hand, has a large number of widely different stocks to select from, for we have to do with several distinct species of indigenous vine coming from various regions of the vast North American Continent, where soils and climates differ in an extreme degree. Of each species there are numerous varieties, and a vast number of hybrids have resulted from the intercrossing of different species, both artificially and in the wild state. Upon a judicious choice the success of the grafted vineyard absolutely depends, for the different stocks differ widely in their suitability to a given soil or climate, and the different European varieties do not all thrive equally well when grafted on the same stock.

ADAPTATION AND AFFINITY.

We must, therefore, take the utmost care to only plant a stock thoroughly well suited to the soil and climate of each locality, and to only graft it with a variety which has proved itself capable of doing well on that particular stock. The suitability of the stock to soil and climate is known as adaptation, whilst the harmony existing between stock and scion is termed affinity. It is an undeniable fact that adaptation is a more complex question in the case of the American than in that of the European vine; the latter grows well in almost any soil and in widely different climates, but especially as regards their soil requirements, Americans are far more difficult to suit. Though it is possible to find a resistant stock capable of being successfully used in almost any given soil, the matter is one which demands the most careful consideration.

It is a consoling fact that Australians have, so far as adaptation is concerned, one great advantage. I refer to the absence of an excessive proportion of lime in the majority of our soils. An excess of lime has, in many old European districts, been the greatest obstacle to successful reconstitution, for the great majority of American vines show a marked antipathy to a high percentage of this element in the soil. In very calcareous soils most of them suffer from a disease known as chlorosis. The leaves turn yellow, and the plant suffers from a general loss of vigour, rendering it impossible to obtain satisfactory results from it. Though we have little to fear from chlorosis and the evil effects of too much lime, we must not forget that we occasionally suffer from droughts, and many Americans are very susceptible to prolonged dry weather. Some excellent stocks in sufficiently moist soils may prove failures in some of our dry Northern districts.

As regards affinity, we must remember that a vine which gives good results grafted on one stock may not do nearly so well grafted on another.

The operation of grafting accentuates difficulties of adaptation, and insufficient affinity aggravates the trouble. For example, the same vine which may remain green and free from chlorosis in a calcareous soil, if ungrafted, may suffer to some extent even if grafted with a scion for which it possesses considerable affinity, whereas, if this be faulty, the result will certainly be total failure. Adaptation and affinity are thus closely linked together, and the one a necessary complement to the other.

This is not the place, nor does time permit me to deal at length with practical details such as these, no matter how vital their importance: besides, those interested will find full information on the subject in the excellent work of Vialla and Ravaz, *American Vines—their Adaptation, Culture, Grafting, and Propagation*, which was translated by Messrs. Dubois and Wilkinson for the Department of Agriculture.

It is far from my desire to alarm those about to reconstitute. If I have dealt at some length with the difficulties of the problem, it is because I feel convinced that any careless and haphazard attempts at its solution will most probably result in failure and disappointment, whilst if we are careful to avoid mistakes, Reconstitution is destined to be as grand a success here as it has been in France and other countries.

### RECONSTITUTION IN FRANCE.

That it has been a magnificent success in France, is one of the most notable facts in contemporary agriculture. The increase in the area under grafted resistant vines during the past thirty years has been enormous.

The following table, taken from the introduction to *American Vines: Their Adaptation, Culture, Grafting, and Propagation* (Vialla and Ravaz), showing the acreage under grafted resistant vines, is very striking:—

| | |
|---|---|
| 1880 ... ... ... | 16,102 |
| 1885 ... ... ... | 188,230 |
| 1890 ... ... ... | 1,090,045 |
| 1900 ... ... ... | 2,404,895 |

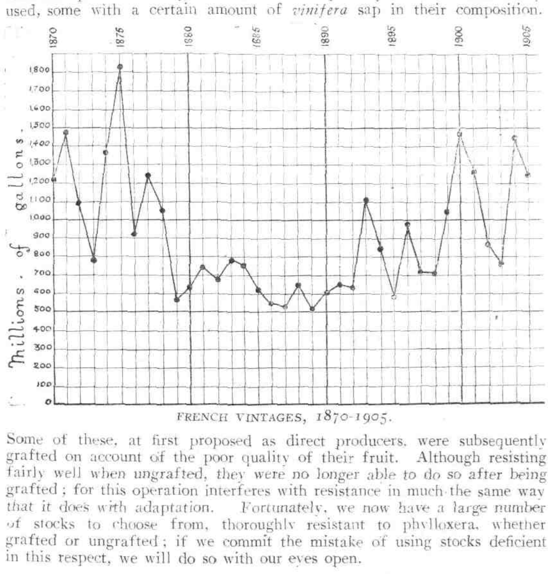
The statistics concerning the total wine yield of the vineyards of France for the past thirty-five years are most instructive. The decrease in the yield from 1878 to 1893, caused by the ravages of phylloxera, is very noticeable; the increase after 1893, due to the coming into bearing of the reconstituted vineyards, is equally striking. The average French yield for the past ten years is just about 1,000 millions of gallons. Previous to reconstitution, during the depression caused by phylloxera, it had dwindled to little more than half that quantity, while the average yield is now practically equal to what it was prior to the appearance of phylloxera. The following chart shows graphically the quantities of wine vintaged each year since 1870.

### FRENCH MISTAKES.

The French are undoubtedly the pioneers of reconstitution, and they have paid the usual penalty, that of making many mistakes. Though one cannot help admiring the magnificent recovery made by viticulture in France, the fact must not be lost sight of that it is only by slow degrees that ultimate success has been achieved. Since 1876, when grafting on resistant stocks was first proposed as a solution for the phylloxera problem, until comparatively recently, the history of French reconstitution has been one of failure rather than one of success. Many thousands of acres have been replanted, not once but several times, and of the resistant stocks first proposed and extensively planted, few have stood the test of time. It is

only by carefully noting past failures and avoiding the causes responsible for them, that the vine-growers of France have been able to achieve the splendid results already referred to.

A few of the leading causes of failure in France may be briefly reviewed. In the first place we have insufficient resistance to phylloxera. It is because of its resistance that we employ the American stock at all. To employ any but such kinds as possess this power in a high degree is, to say the least, illogical. Yet the mistake was frequently made in the early days of French reconstitution with disastrous results. Difficulties in adaptation, especially in calcareous soils, led to the use of many stocks which were not pure Americans, or which did not belong to the most resistant species. Many more or less complex hybrids were extensively used, some with a certain amount of *vinifera* sap in their composition.




FRENCH VINTAGES, 1870-1905.

Some of these, at first proposed as direct producers, were subsequently grafted on account of the poor quality of their fruit. Although resisting fairly well when ungrafted, they were no longer able to do so after being grafted; for this operation interferes with resistance in much the same way that it does with adaptation. Fortunately, we now have a large number of stocks to choose from, thoroughly resistant to phylloxera, whether grafted or ungrafted; if we commit the mistake of using stocks deficient in this respect, we will do so with our eyes open.

### QUALITY OR QUANTITY.

One of the most serious mistakes, and one which is the greatest blot on French reconstitution, is the sacrifice of quality to quantity in the majority of the replanted districts.

The great bulk of the wine grown in France is consumed in France. The shrinkage of the yield caused by phylloxera led to a very considerable rise in price. Wine imports increased and artificial wine was largely made.

Wine was at a premium, and even the most inferior kinds sold at very payable prices. The financial results of the first successfully reconstituted vineyards were so encouraging that quality was ruthlessly sacrificed. Instead of using choice varieties as scions, preference was given to those capable of yielding the heaviest crop. The result has been the glutting of the market with enormous quantities of inferior wine. The wine trade is quite demoralized, and periodicals connected with it are loud in their lamentations. The viticultural crisis, as it is termed, is the chief topic in wine-growing centres, and is no doubt the result of the sacrifice of quality to quantity.

Let us profit by the lesson and only plant choice varieties in Australia. Bordeaux, Burgundy, Champagne, and other French districts where choice wines are grown, had the wisdom to graft only their old cepages on to the resistant Americans, and they continue to turn out the wines for which they are famous all over the world. We are most fortunate in having this great object lesson of French reconstitution to guide us. It was the first country infested, and it was French scientists and practical men who found out what phylloxera really was, and who have taught us most of what we know about it and about the wild vines of America, for they have been more exhaustively studied in France than in their native country. Local difficulties will undoubtedly arise, but as regards the main lines of the problem the back of the pioneering work has been broken, and we are in a vastly better position than the unfortunate growers of France thirty, or even fifteen years ago.

### AUSTRALIAN MISTAKES.

Reconstitution entails the radical replacement of existing vineyards. It thus gives us a splendid opportunity to correct errors we have made in the past. That many mistakes have been made is well known. Our viticultural industry is not the success that has been anticipated for so many years, and yet few countries have been so well fitted by nature for the cultivation of the vine. That we can, and have produced wines capable of holding their own anywhere has been abundantly proved by prizes awarded at the leading Exhibitions of the world. The recent wine-tasting held under the auspices of the Viticultural Society of Victoria may also be mentioned.

Few agricultural industries are of greater value to a country than viticulture, especially in these days of closer settlement, for few branches of agriculture need so large an expenditure per acre for labour, as is evident from the general prosperity of those districts where the vine is largely cultivated and the comfortable living that can be made off a small area of properly worked vineyard. That the industry should languish is chiefly because we have not worked our vineyards to best advantage. The tendency has, with some noteworthy exceptions, been to plant too large an area, and to work it as cheaply as possible. If the yield was small, at any rate, it did not cost much to obtain. Under such conditions, satisfactory results could not reasonably be expected. Far better to have a vineyard of 20 acres properly established and carefully looked after, than double that area worked on the starvation system, as has too often been done with us in the past.

Deep preliminary cultivation is the first and most important step in the creation of any vineyard, yet thousands of acres of our vines have been planted on soil which received no more preparation than would be necessary for a wheat crop. The necessity for deep preliminary cultivation is

emphasized in the case of grafted American vines. Their roots do not as a rule, plunge so deeply into the ground as those of the old European vines. The fact of grafting also increases the need in this direction. To plant grafted resistant vines on any but properly prepared land, is to court certain failure, more especially in our dry Northern areas. Selection of cuttings has been almost entirely neglected by us in the past, so much so that many of the varieties we cultivate have absolutely deteriorated. Want of attention to the various cultural operations necessary each year is also frequently responsible for unsatisfactory results, but such technical points can only be hinted at here. A very common mistake has been the attempt to produce on one vineyard too many types of wine, each grower trying to be a wine merchant. In old wine countries long experience has taught the type each locality was best suited to produce, and growers confine themselves to the production of that type. In Victoria, each grower has planted a certain area of, perhaps, a dozen different varieties, some of which were quite unsuited to the locality. Hence the production of many nondescript wines of little value.

### OUR HOPES FOR THE FUTURE.

We must in the first place avoid our own past mistakes. We must also avoid the mistakes made by growers in France and other countries. These have all been placed on record, and are available for us to profit by. The lesson we must remember is that quality must always be our main object. It is only by grafting choice varieties and devoting all our efforts to turning out the best wine possible, that we can hope for ultimate success.

Although old world experience is of the greatest value, it will not do for us to trust to it alone. Australian experience must be our final Court of Appeal. Just as in the case of fertilizers, the information given by the plant itself as to its soil requirements through the medium of experimental plots, is more reliable than that based on chemical analysis alone, so also is it only by careful study of the different stocks in each locality that we can accurately judge as to their suitability or otherwise. We must only plant the best stocks, or those best suited to the conditions under which they will have to grow. We must not be satisfied with stocks which do fairly well. The number of those best suited to any particular locality is, as a rule, limited to a few. The revolution in wheat-growing, brought about by the general use of phosphatic manures is well known. It is the direct outcome of the experimental work carried out by our Agricultural Department. Similar experimental work in the case of resistant stocks will be of the greatest value to our vine-growers. Good work has already been done, and is being done by those who have commenced to reconstitute, and it is only by carefully comparing the results obtained from the use of different stocks under varied conditions that we can hope to proceed on absolutely sound lines and with certainty of success.

It is my firm belief that phylloxera is not going to wipe out our viticultural industry. If we reconstitute carefully and on correct lines, the industry will emerge from its severe trial, strengthened and improved by the correction of our past errors, and there is not the slightest doubt that our reconstituted vineyards, by the quality of wines they will produce and the financial returns to be obtained from them, will amply repay those who have had sufficient faith in the industry to undertake the task of reconstitution.

**The Convention Papers will be continued in the October number of the Journal.**

# VICTORIA'S GREEN VEGETABLE EXPORT TRADE.

*C. French, F.L.S., F.E.S., Government Entomologist.*

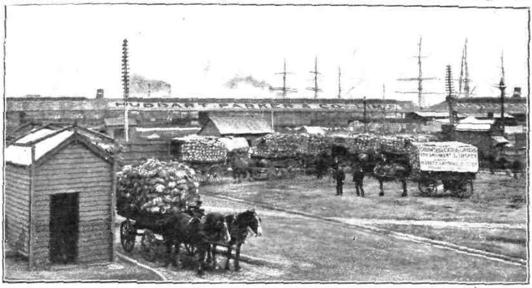
The geographical position of Victoria is eminently favorable for the production of green vegetable crops, and for years this State has held pride of place as the "cabbage garden" of Australia. The particular portion of Victoria devoted to this class of husbandry is the shire of Moorabbin, which includes Brighton proper, East Brighton, South Brighton, Cheltenham, Mordialloc, Heatherton, Dandenong, Notting Hill, Oakleigh, and Burwood. Cauliflowers are the leading green vegetables grown for

VICTORIAN CABBAGES AND CAULIFLOWERS FOR EXPORT.

export. As against any other exported green vegetable the value is at least five to one. The Sydney market absorbs most of the export output, Brisbane taking the balance. The people of Sydney depend almost entirely on Victoria for their supply of cauliflowers and cabbages. During the past twelve months this State has sent away no less than 87,713 dozens of cauliflowers and cabbages, representing an approximate value of £17,542. The distribution of freight between the railways and shipping companies is about even. As the freight charges are two shillings per dozen by rail, and one shilling and ninepence by boat to Sydney, it will be seen that these vegetables play an important part in the turnover of the railways and the shipping companies. The freights to Brisbane are much higher than those to Sydney, thus it is that Brisbane receives only about one-tenth of the quantity taken by Sydney.

The packing of these vegetables requires a good deal of skill. The loaded waggons are brought in over rough country roads, and the vegetables are stacked (as shown in the illustrations), so that they can solidly resist jolting. A loaded waggon holds about 66 dozen, but some packers have crowded on as many as 70 dozen. The waggons begin to arrive at the

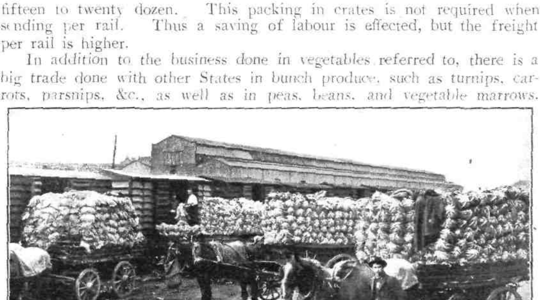
depôt at 7 a.m. The first of the photographs gives a view of the scene outside the Government Cool Stores, taken in the early morning. On arrival at the steamer the vegetables are packed in crates, holding from



AT THE RAILWAY WEIGHBRIDGE.

fifteen to twenty dozen. This packing in crates is not required when sending per rail. Thus a saving of labour is effected, but the freight per rail is higher.

In addition to the business done in vegetables referred to, there is a big trade done with other States in bunch produce, such as turnips, carrots, parsnips, &c., as well as in peas, beans, and vegetable marrows.



LOADING INTO RAILWAY TRUCKS.

An impression prevails that the Chinese are the principal growers in this trade. The proportion of Chinese market gardeners in the State of Victoria is 44 per cent. Out of 4,622 male market gardeners, for the year 1905, 2,022 were Chinese. The great bulk of the vegetables mentioned in this article and shipped to New South Wales and Queensland are grown and despatched by Europeans, as the Chinese mostly dispose of their produce in the local markets, and sometimes by hawking.

The following figures show the volume and value of this trade for the last twelve months:—

| | |
|---|---|
| Cauliflowers, 73,090 dozen ... | ... £14,618 |
| Cabbages, 14,623 dozen | 2,024 |
| Bunch produce, 59,400 dozen bunches | 2,228 |
| Peas and beans, 280,000 lbs. | 1,400 |
| Marrows, 7,400 dozen | 925 |
| Total value ... | ... £22,095 |

# THE PROCLAIMED PLANTS OF VICTORIA.

(Continued from page 477.)

*Alfred J. Ewart, D.Sc., Ph.D., F.L.S., Government Botanist; and J. R. Tovey, Herbarium Assistant.*

## The Stinkwort.

*Inula graveolens, Desf.* (*Compsitæ.*)

A hairy viscid (clammy or sticky) much branched, large herb, woody at the base; the lower leaves oblong, lance-shaped, imperfectly toothed; the upper leaves very narrow, and with even margins. This pest is a native of the Mediterranean regions. An alcoholic extract is prepared from the leaves, freed from essential oil, and was known to the ancient Greeks, and is still used in America for amenorrhœa. The demand is, however, exceedingly small, and is amply satisfied from local sources, so that the Stinkwort has no commercial value in this country. It should be pulled up or hoed before flowering. Proclaimed under the Thistle Act for the whole State—April, 1892.

## Cape Tulip.

*Homeria collina, Vent.* (*Irideæ.*)

It has a swollen underground stem, ¾ to 1 inch in diameter, with thick, dark brown, latticed coats. The leaf is linear, stiff, 1½ to 2 feet long. Stem 1 to 1½ feet long, bearing one to four clusters of flowers: their bases are ensheathed by a membranous curled leaf, 2½ to 3 inches long. Floral leaves bright red, with a yellow throat inside, 1¼ to 1½ inches long. Anthers and column each ¼ inch long. Capsule club-shaped, an inch long. *Variety—miniata.* Sweet. Corm. globose, with latticed coats. Lower leaves 1 to 2 feet; linear, rigid. Stem 1 to 1½ feet high, bearing several clusters of flowers. Spathes 1½ to 2 inches long. Floral leaves, fulvous, with a yellow stalk, ¾ to 1 inch long, ¼ inch broad. Anthers shorter than the column. Four varieties of this plant have been described as separate species. The variety *miniata* appears to be more common in Victoria than the type form, and hence the illustration is made from this variety. The Cape Tulip is a native of South Africa. It is poisonous, and should not be allowed to spread. Apart from the abundance of seed, it is also propagated by the innumerable little bulbils (small buds or bulbs) which the plant bears. It should be carefully dug up before it seeds, and burnt with the aid of brushwood or rotted in heaps with quick-lime. Proclaimed under the Thistle Act for the whole State—December, 1895.

(*To be continued.*)

PLATE 4.

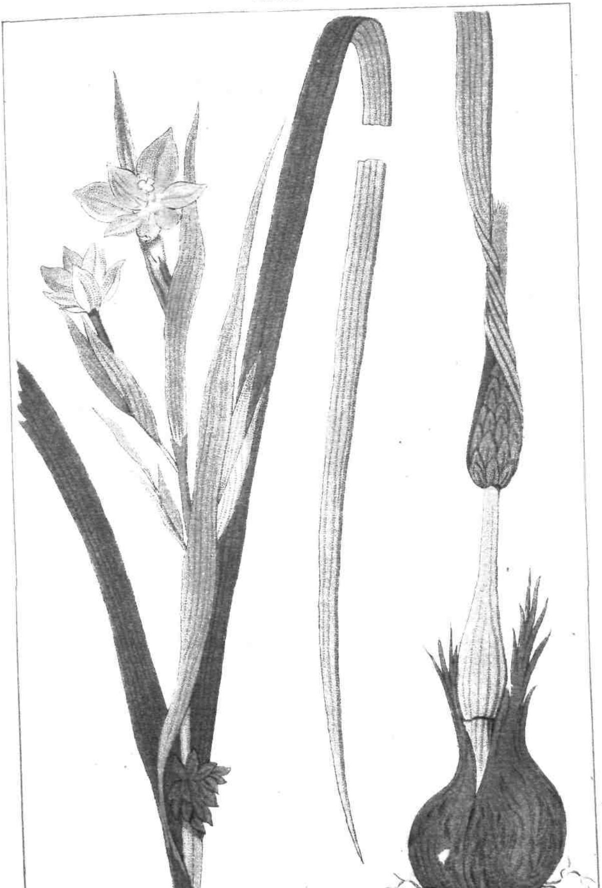
O. Wauer, Del.

J. R. Tovey, Direxit

STINKWORT.

*(Inula graveolens, Desf.)*

PLATE 5.



O. Wauer, Del.

J. R. Tovey, Direxit.

CAPE TULIP.

# DISEASES OF FARM ANIMALS.

*S. S. Cameron, M.R.C.V.S., Chief Veterinary Officer.*

## V.—NOTIFIABLE DISEASES UNDER THE "MILK AND DAIRY SUPERVISION ACT 1905."

(*Continued from Page* 489.)

## Contagious Pleuro-Pneumonia of Cattle.

### INTRODUCTION INTO AUSTRALIA.

Pleuro-pneumonia was introduced to the continent of Australia from England by means of a shipment of five cattle, imported by Mr. Boadle, of the Plenty River district, and landed in Melbourne during October, 1858. In those days no quarantine period had to be undergone, and shortly after arrival one of the cows sickened, and died six weeks later. Two others of the five succumbed in December and January following, and from that time onwards the cattle on the farm, whether home-bred or introduced, were attacked indiscriminately, three or four dying every month. *Post-mortem* examination of the early cases was made by Mr. H. Wragge, M.R.C.V.S., who diagnosed pleuro-pneumonia, and who was supported in his diagnosis by Messrs. Miscamble and Pottie, veterinary surgeons. It was not, however, until twelve months later (October, 1859) that any effort was made to obliterate the disease. In September of that year the mortality had been so persistent and continuous that in stock circles feeling was roused to the grave danger which threatened, and at a meeting of stock-owners, held at the Port Phillip Farmers' Society office, it was decided to raise a fund for the purpose of purchasing and destroying all the cattle on Mr. Boadle's farm (*vide* the Melbourne *Argus*, 17th September, 1859). This was done, and the farm placed in quarantine, but action had been too long deferred, and the disease spread, and has never since been eradicated. The story goes that the quarantine of the farm and the other measures adopted would have been effective only that a bullock-driver camped his team one night in the infected paddock, and, moving on in the morning, carried infection to other camping grounds, and so spread the disease. Without desire to shatter the romantic halo surrounding an incident so widely believed, and so enchantingly circumstantial, common-sense compels the rejection of the story. At this distance of time, when a critical survey can be calmly made, and in view of an enlightened knowledge of the facility with which the disease spreads, it is hard to believe that during the twelve months, when no restrictions were placed on the movement of cattle to or from the farm, the disease remained confined to Mr. Boadle's property, while immediately on the imposition of quarantine a chance visit of working bullocks should be the means whereby it should make its escape. It suggests a Quixotic resentment on the part of the disease of attempts at the restriction of its liberties; and it is more reasonable to conclude that the rumours which were in existence during the period of inaction, to the effect that the disease had attacked other herds, and was accountable for unusual fatalities which occurred among cattle in the district at the time, had good foundation in fact.

### HISTORY IN AUSTRALIA.

The history of pleuro-pneumonia in Australia bears out the experience of other countries in regard to this disease and of this country (Australia) in regard to all contagious diseases that have been introduced, viz.:—That on the advent of a new disease to a new soil its virulence, capacity for quick spread, and its death-dealing properties are at first alarming. Later on these characteristics become less pronounced, and when once thoroughly established in its new home, the disease becomes decreasingly less formidable in most respects. On introduction here pleuro-pneumonia was a violently contagious and fatal animal plague, rushing rampant through the land, and involving losses to the extent of 75 per cent. of the animals in the herds attacked. It quickly spread westward to South Australia, and northward through New South Wales to the Gulf country and uttermost parts of Queensland and the Northern Territory, and ever as new country was struck its virulence and mortality was accentuated. Nowadays, however, so greatly has its lethal influence waned, a 30 or 40 per cent. loss in an affected herd is looked upon as a severe visitation.

Unfortunately, the history of the efforts to eradicate the disease or control its spread is a history of crass ignorance and benighted folly, and is illustrative of the cloud of darkness in regard to the nature of diseases of stock with which Australian stock-owners and official authorities allowed themselves to remain enveloped for many years, and which can scarcely yet be said to have lifted. It is a sad reflection that, in spite of the experience of other countries, and in spite also of the scientific veterinary help which was available at the time, as late as 1875, the idea of pleuro-pneumonia being contagious was obstinately and actively opposed. In that year a Royal Commission was appointed to investigate the question of contagion in regard to the disease; and while it was investigating and gathering observations to establish the non-contagious theory, the disease was leaping beyond the practicability of control. The members of the commission were to a man non-contagionists, and they laboured with all the strength of a preconceived opinion to prove their side of the controversy. They brought over healthy cattle from Tasmania, where pleuro-pneumonia had never been, placed them in stalls beside diseased animals, inoculated them in various ways, and then declared their inability to communicate the disease by contagion. They precipitately reported the result to the Legislature, and gave advice, based upon their failure, deprecating further legislative interference. But Nemesis was at hand, for the Government printer's ink was hardly dry upon their report when a counter report came from the butchers of Geelong, who had bought the experimental animals for slaughter, that they were all so diseased with pleuro-pneumonia as to be unfit for human food, and demanding back their money (*vide* the *Australasian*, 1875). While the methods of this commission can hardly be taken as a model in all respects for scientific investigation, the dramatic finale to their experiments was nevertheless convincing, and although the critical period when the disease might have been comparatively easily stamped out was allowed to pass without decisive action, the question of its contagiousness has not since been seriously contested.

### PREVALENCE IN AUSTRALIA.

The absence of published information regarding the known prevalence of the disease in different States, makes it impossible to state with any

degree of definiteness the extent to which the national wealth suffers at the present day from this disease. From 1860 to 1872, however, the average annual loss of cattle from pleuro-pneumonia throughout Australia was recorded at 125,000 head, or a total of one and a half millions during the twelve years, representing a money value in the neighbourhood of ten millions of pounds sterling. It should be explained that this period covered the time when the contagion was operating on new ground with a virulence that has in later years considerably abated; but against any favorable inference that may be drawn from this is to be placed the natural and continuous increase of cattle throughout all the States, as new country has been stocked up: by increase in the number of animals available for infection the disease has greater scope, and its wider spread may be presupposed; so that while the proportion of losses may have lessened, the actual amount is scarcely likely to have done so. Later figures from Queensland seem to support this view. In that State alone during the early nineties it was estimated that the yearly loss amounted to £640,000.

In Victoria, during the first six months of 1904, fourteen outbreaks of pleuro-pneumonia were reported to the Stock Department.

## DEFINITION.

PLEURO-PNEUMONIA is a specific, contagious and infectious, communicable and inoculable, febrile disease affecting the bovine species only, localised in the lungs, and characterized by :—

A lengthened period of incubation, high temperature and other febrile symptoms, inflammation of the substance of the lungs and their covering membrane (the pleura) with extensive consolidation of lung tissue and plugging of the air vesicles with exudate, adhesions of the lungs to the chest-wall, and profuse exudations of lymph into the chest cavity (hydro-thorax).

The *period of incubation* of the disease, that is the time elapsing between the contraction of infection and the development of symptoms during which the disease is "brewing," so to speak, varies from three to six weeks as a general rule; sometimes it is lengthened to three months or beyond, and it may be as short as eight days.

## CAUSES—ESSENTIAL AND AUXILIARY.

The ESSENTIAL CAUSE is a contagium, or germ, and the contagiousness of the disease was conclusively demonstrated before the aid of present-day bacteriological methods could be invoked. Indeed, such methods have been singularly unsuccessful in regard to the elucidation of the primal cause of the disease until a year or two ago, But practical experience in connexion with the incidence of the disease under all circumstances—whether as a district outbreak or an extension to a new country—has fully established that it occurs only as a result of transmission of contagion from a pre-existing area of infection. This has been the experience in all countries to which the disease has been introduced, and it has been quickly recognised in all such countries, except perhaps Australia, where, as previously stated, for close on twenty years its contagiousness was disputed by men of "practical" repute.

The BACTERIOLOGY of the disease is by no means so complete as to allow of anything but indefinite pronouncement. The germ is one of the smallest yet discovered, requiring a magnification of 2,000 diameters before it can be studied; and it cannot be satisfactorily cultivated on the ordinary media

in the laboratory. It has, however, been artificially grown by an ingenious method devised by Metchnikoff, and practised by Nocard, viz., in a celluloid capsule introduced into the tissues beneath the skin of a living animal. By this unique method of culture, the growth of a minute but actively mobile organism may be observed in about 15 days, which, "when inoculated on cattle, produced the unequivocal phenomena of lung plague (pleuro-pneumonia), in a period of from 8 to 15 days." The late eminent French veterinarian, M. Nocard, devised another method for the separation of the organism from the exudate by filtering under pressure through a Pasteur-Chamberland filter, having a candle of fine porosity. It was found that while all other germs were held back, the pleuro-pneumonia organism filtered through, and cattle inoculated with the filtrate contracted the disease.

AUXILIARY CAUSES.—These may be all such circumstances as tend to the diminution of the normal vigour of the animal and its physiological resistance to the invasion of disease. The existence of other disease or derangement, as, for instance, a "cold," or catarrh of the lungs, or lack of tone during convalescence from such disease will materially assist the determination of an attack of pleuro-pneumonia if the infection is in the vicinity, as will also such depleting influences as over-driving, exposure to cold and wet, and insufficiency of nutritious food. Cows at calving time, and all cattle when undergoing change of coat or when seasons are changing, are more prone to contract infection.

### MEANS OF SPREAD.

The disease is contracted under ordinary circumstances by inhalation only. The infection of paddocks and buildings is generally brought about by the introduction of sick or infected animals; more rarely by other intermediaries—attendants, utensils, fodder, manure, &c. These latter agents, if not disinfected, may be a source of danger for months after contamination, as the infectious agent apparently possesses great powers of resistance, and will live in some media for three or four months, or longer. The disease is infectious from its very beginning, even before any marked symptoms are observable, but the infectious virulence reaches its maximum when the disease is fully developed. Transmission of infection may occur from eight to ten weeks and more from the apparent cessation of an outbreak or recovery of affected animals. In cases where, on recovery, diseased portions of lung have become encysted (cased in or surrounded by a capsule of fibrous tissue), so forming what is called a necrosed centre, infection may occur from such a recovered animal at any time afterwards on the incidence of a cold or any cause resulting in the breaking-down or bursting of the cyst. Thus it often happens that months or years after recovery from an attack an animal may become again infective, and thus also may be explained the occurrence of many outbreaks, which appear to be of spontaneous origin. It is always safer to regard a recovered animal as a potential source of reinfection. Amongst animals in the same building or paddock infection is usually transmitted through the air, and it may be contracted in this way from a distance of 50 yards or more. All cattle are not equally susceptible to the disease; it is usually estimated that the proportion of those which resist attack is about 25 per cent.

### ARTIFICIAL TRANSMISSION.

Many experiments have been conducted with the object of conveying the disease by artificial means, for it was desired in the old days to furnish

some such clinching proof of its contagiousness. The Victorian Pleuro-pneumonia Commission, previously adverted to, failed with inoculations, as also did many other investigators, including Willems (in Belgium) and Gamgee (in England), the latter being also unsuccessful by feeding with pieces of diseased lung and injection of lymph into the wind-pipe. In fact, all such attempts failed until the author, in 1890, during experiments conducted at the Melbourne Veterinary College in connexion with the artificial cultivation in calves of pleuro-preventive lymph, discovered that true pleuro-pneumonia could always be set up by hypodermic injection of lymph if the injection was made at a point sufficiently near the entrance to the chest that the swelling induced might extend along the trachea (wind-pipe) to the root of the lungs, and thence into the lung substance. The result, *i.e.*, the setting up of pleuro-pneumonia disease processes, is always the more certain if the experimental animal remains or is kept in the recumbent position during the time the disease is developing, and in this case the disease is most extensive in the undermost lung—a result of the gravitation of the exudate or lymph contained in the progressive swelling. The characteristic lesions of pleuro-pneumonia in the lungs and on the pleura were repeatedly produced in this way, and were vouched for by my then colleague, Mr. W. T. Kendall, M.R.C.V.S., who collaborated in the experiments, and by Mr. Henry Wragge, M.R.C.V.S., Mr. Charles Marson, M.R.C.V.S., Mr. Robert Stirling (Chief Inspector of Stock), Mr. Charles Lynot, and Mr Charles Campbell (Queensland). That the authenticity of the discovery might not be impugned, these gentlemen, all of whom were widely experienced in the disease, certified in writing to the identity of the artificially-produced lesions with those of ordinary pleuro-pneumonia, and that "the marbling and consolidation of the lungs of the inoculated calves was indistinguishable from that found in naturally-contracted pleuro-pneumonia."

It was not until the experiments of Nocard, previously mentioned, were carried out in 1897-98 that the artificial transmission of pleuro-pneumonia was again successfully accomplished.

### NATURE OF THE DISEASE.

Pleuro-pneumonia has been usually considered as a systemic disease, but observations made during the prosecution of the author's experiments above referred to seem to force the conclusion that it is a purely local disease—as much local to the lungs as a wound is to the part in which it is situated, or as malignant pustule (localized anthrax) is on the arm of a man. When the virus (lymph) is introduced, whether naturally or artificially, certain inflammatory changes occur successively—congestion, exudation of lymph, perhaps gangrene or sloughing, or perhaps absorption of the lymph—and these changes occur, and are of the same character, no matter at what part of the body the introduction takes place—whether in the tail by inoculation or in the lungs by inhalation—the different appearances presented in each case being solely dependent upon the anatomical character of the tissues concerned. The tissues of the tail being comparatively hard and unyielding, the resulting swelling is also hard, tense, and circumscribed; while, in the soft, spongy tissue of the lungs, the virus produces a correspondingly soft swelling, only physically and not essentially different from that in the tail or any other part inoculated.

My observation was that when lymph was inoculated under the skin behind the elbow the swelling spread by contiguity of tissue in an ever increasing radius from the point of inoculation —back to the flank and thigh, and forward under the shoulder blade up the neck to the jaw, or round the first rib into the chest cavity, and thence to the lungs. Combining this observation with a knowledge of the way in which pleuro-pneumonia lesions in the lung spread, eccentrically from lobule to lobule until the whole lung may be involved, it is a fair deduction that the processes—that artificially produced by inoculation, and that naturally produced by inhalation—are the same, and that therefore before the disease can be set up in the lungs by inhalation there must be a wound, abrasion, or other weakening of the lung tissue or lining membrane of the bronchial tubes, whereby natural inoculation can occur. This would account for the increased susceptibility to contract the disease of animals suffering from a cold or catarrh, and it would also furnish a reasonable explanation of the fact that many animals in an affected herd escape infection.

## COURSE AND SYMPTOMS.

Although pleuro-pneumonia may have acute phases, on the whole it is a slow-developing and slow-running disease. From the termination of the period of incubation, during which no symptoms are observable, until death or recovery takes place, a period of from two to eight weeks usually elapses, the average being about four weeks, but in some cases, especially the earlier ones of an outbreak in a newly-infected district, the course of the disease is acute and rapid, and death will occur within a week.

The SYMPTOMS vary as the disease progresses, and it may be as well to make it clear at the outset that all the symptoms here given will not likely be exhibited by any one case or even during any one outbreak, but some or others of them may always be observed, and they are likely to be sufficiently pronounced in character to warrant a diagnosis of pleuro-pneumonia when they are observed in two or three animals simultaneously, or within a short period of each other.

The first symptom observed is usually a short, dry, weak cough, more frequent in the mornings or after drinking, or when the animal rises or changes position or is "bustled." At the same time, the internal temperature is usually increased to 103 or 104 deg. F.; there are slight shivering fits, the coat looks harsh and staring, the muzzle is dry and devoid of "dew," appetite for food and chewing of the cud are partially or totally suspended, but an intense thirst is exhibited, and in milking cows there is a sudden drop in the quantity of milk secreted or a total cessation of secretion. Constipation, with balled and glazed fæces, and scanty, high-coloured urine, are also primary features. While these signs of fever are developing, the animal mopes about listlessly in the neighborhood of trees, under which it stands with back humped, head and neck stuck out, and hind limbs placed forward and apart, with a tendency to knuckle over on one or both hind fetlocks. Although not eating much, it looks fuller than its fellows, and exhibits a peculiar disposition to always face towards the observer, and a disinclination to move away from tree shade. Frequently affected animals exhibit a tendency to rush or horn other animals and attendants, and it is therefore often dangerous to approach them. Later on the cough becomes more pronounced, paroxysmal, and obviously painful. During the coughing spells, the back is arched and the head and neck are

convulsively thrown forward, and between-times a moan or a grunt accompanies the now accelerated and laborious breathing. Each expiratory effort is forced by a distinct flank heave or "tift." The ribs are fixed, and the elbows out-turned. Affected animals seldom lie down, and if they do so *it is only for a few moments, during which they always lie on the diseased* side—most often the right. There is a discharge of mucus from the nostrils, and the eyes are protruded and glassy looking. The ears, horns, and legs are sometimes hot, at other times cold. When thumb pressure is applied between the ribs there is evident pain and "flinching." The animal is hide-bound, the skin being very tight over the ribs, and any exertion produces great distress. There is rapid falling off in condition, the contour lines of muscles become deeply marked, and the emaciated animal presents a tucked-up and miserable appearance. In-calf cows may abort at this stage. The constipation may continue to the end, or it may be succeeded by a diarrhœa, which, if not profuse or long continued, may be taken as a favorable sign for recovery, indicating, as it does, that the fluid in the chest is being absorbed and eliminated from the system. *During this time the pulse is erratic, and of little use as a guide, but the* temperature rises, and will usually be found to be 104 deg. F. or 105 deg. F. In some cases, it may reach as high as 107 deg. F. until just before death, when a sudden fall to normal or below is ominous.

For accurate diagnosis the chest sounds on auscultation (with or without the stethoscope) and percussion are all important, and furnish a means whereby veterinary surgeons can oftentimes decide in doubtful or disputed cases. By physical examination of the chest, it may also be ascertained whether there is dropsy of the chest cavity (hydro-thorax), and whether therefore a supply of lymph for inoculating purposes could be obtained on slaughter. In such cases a faint tinkling, bubbling, and splashing sound is heard on the movement of the chest wall, and the normal lung murmur is absent.

*In the last stages of the disease, any of the above detailed symptoms* which have been present become exaggerated, the animal falls from weakness, and is unable to rise, and, to the accompaniment of groans and gasps, death results from asphyxia.

In those cases in which recovery occurs, the symptoms moderate about the second week, but convalescence is slow, lasting for several weeks. It is seldom, however, that complete recovery takes place. Although the animal appears to have regained robust health, there usually remains in the lungs an imprisoned mass of morbid matter, from which the disease may break out at any time on the incidence of a cold or catarrh or other cause, and, while not in all cases reinfecting the same animal, the matter set free will cause a fresh outbreak of the disease among animals in contact.

## POST-MORTEM APPEARANCES.

The state of the lungs on *post-mortem* examination varies according as the animal is killed at different stages or dies of the disease. In acute *and rapidly fatal cases the lungs are engorged with blood, black or deep* purple in colour; they are soft, easily broken down, and loaded with discoloured lymph. In an ordinary case, when the inflammatory process (pneumonia) has become developed, the affected lung is enlarged, solid, and very heavy; the bronchial tubes and air vesicles are blocked with coagulated lymph, so that no air is contained, and the lung sinks in water. The lung has

a consistence like fresh liver, and is as easily torn. The colour, however, is the distinctive feature, or rather the arrangement of colour. On section the cut surface presents the characteristic red "marbling," produced by the yellowish bands of interlobular tissue and exudate surrounding the congested or inflamed lobules. These circumscribed lobules appear like patches of blood-red, brown-red, and dark brown tissue separated from each other by the yellow-red bands, each patch being of a different shade to its neighbour, so that the cut surface presents a colour scheme resembling a piece of smoothened red marble. This is the stage of *red hepatisation* or consolidation. In lungs inflamed for a longer time the colour scheme of the lobules is altered to a light-red, yellow-red, and yellowish or whitish-grey in contiguous lobular patches, and the term *grey hepatization* is given. Along with these conditions of the lung substance the pleura (the membrane covering the lungs and lining the chest wall) also presents characteristic features. At first it is merely roughened, but as the disease progresses an exudate is thrown out from it, which coagulates as a yellowish layer of fibrinous material. These layers may be as much as an inch in thickness, one lining the chest wall and the other covering the lung, and they oftentimes become attached to each other, forming fibrous "adhesions" of the lungs to the ribs. In the space between the two layers (the pleural cavity or pouch) is a varying quantity of fluid called "lymph." This is really an inflammatory exudate from the inflamed pleural surfaces. If not contaminated by blood during the opening of the chest this lymph, except for a few flakes in suspension, should be a clear straw-coloured liquid, slightly gummy to the touch, and coagulating into a floppy, jelly-like clot shortly after contact with the air. Lymph of similar quality permeates the diseased lung substance, from the cut surface of which it will ooze freely.

Sometimes on slaughter of an affected animal no lymph will be found in the chest cavity, and the term "dry pleuro" has been coined to designate this condition. There is really no such thing as dry pleuro. In all cases of pleuro-pneumonia at some stage there is exudation of lymph, and when it is not found it has usually been absorbed, such absorption being often evidenced previously by the occurrence of diarrhœa; or it may be that the animal has been slaughtered in the early stages before the lymph has commenced to exude. In any case, some lymph will always be found in the diseased lung substance, and this is equally efficacious for inoculation purposes.

### PREVENTION.

Preventive measures include disinfection of premises, isolation or slaughter of affected animals, segregation and inoculation of all healthy contact animals, and quarantine of infected farms or localities.

DISINFECTION must be thorough, and must be applied to *everything* with which infected animals or carcasses have been in contact. It includes cremation methods of disposal of carcasses, litter, manure, forage, and like infection-carriers.

ISOLATION of affected animals should be regarded as a mere tentative measure pending slaughter; for, as has been already indicated, it is bad policy to attempt to cure pleuro-pneumonia or to allow affected animals to recover; they are always a likely means of restarting an outbreak. Isolation of suspected animals is very necessary, but they should be inoculated

without delay. In carrying out isolation, it is of the gravest importance that the healthy animals should be removed from the diseased and suspected —not the diseased and suspected from the healthy—so that the infection may be confined to the one building or paddock.

The length of time during which SEGREGATION, or keeping apart from all other cattle of the remaining healthy animals of a pleuro-infected herd, and QUARANTINE of buildings, paddocks, and farms requires to be imposed, will depend upon intelligent and scientific consideration of a number of circumstances, one of the principal of which is the effectiveness of inoculation. It is here that science-dictated knowledge and level-headed administration comes in, so that, while the essential principles underlying preventive measures are not sacrificed, stock-owners may not be unduly harassed or incommoded.

## PREVENTIVE INOCULATION.

INOCULATION is said to have been first practised by the Arabs in olden times. The practice was followed in the beginning of last century in Germany, but it did not gain many adherents until the researches of Willems, in Holland, in 1850, gave the necessary impetus. In Great Britain, Gamgee and Rutherford (the latter of whom gained his experience of the practice in Australia) have been its principal sponsors, but they failed to attract many followers. Inoculation has been more widely practised in Australia than in any other part of the world, thanks largely to the enthusiasm with which it was introduced and advocated by the late Mr. Graham Mitchell, F.R.C.V.S., whose disinterested and unrewarded efforts in this direction, as in many other directions, were heartily supported by the late Hon. John Stewart, M.R.C.V.S. (M.L.C. in New South Wales), and other professional men.

As to the merits of inoculation, it may be said at once that the Australian experience of it has been such as to warrant full confidence in its effectiveness as an aid in limiting the spread of the disease. Whatever may have been the experience in other countries, there is no doubt that in Australia, from the highest veterinary authorities down to the humblest bullock-driver or "overlander," there is a consensus of faith in inoculation —a faith engendered by repeated proofs of its efficacy and strengthened by experience of the relief it has afforded in thousands of cases from impending financial disaster.

The procedure is simple, so simple, in fact, as to engender a carelessness that at times has resulted in serious harm, such as the transmission of tuberculosis, when lymph from tuberculous lungs has been used, or blood poisoning. The material used is the lymph previously spoken of as occurring abundantly in the chest cavity and in the substance of the lungs. It should be collected free from blood, matter, froth, or other impurities, and should be either used fresh or preserved in sterilized and sealed phials. When used fresh, it is advisable to dilute it one-third or more with sterilized glycerine, otherwise extensive swelling and other serious consequences may result.

The matter of the preservation in effective form of pleuro lymph is an important one in Australia, where it may require to be transmitted great distances for use; and involved in this matter is also the question of the length of time it will remain effective, provided it is preserved from putrefaction. Admixture with glycerine when fresh will usually prevent

deterioration for a period of three weeks or more. It may be kept effective and free from putrefaction for three months or more if placed in sterilized phials or test tubes, with a half-inch layer of sterilized castor oil poured over the surface. Some years ago the author adopted with complete success the method of soaking the threads that are to be used for inoculating in the lymph, and afterwards drying them slowly in an incubator at blood heat. The threads were then placed in sterilized test tubes, plugged with cotton wool, and they could then be depended on for at least three months. Refrigeration of the lymph, or of a piece of pleuro lung containing lymph is another reliable means of preservation. Kept in a freezing chamber at a temperature of 20 deg. F., a pleuro lung will retain its virulence for a year, and the lymph from it at the end of that time will be as effective for inoculation purposes as freshly-taken lymph. Sterilization by filtration through Berkfeldt filter is suggested by Dr. Cherry as a method likely to be successful in that, while the microbe of pleuro-pneumonia will pass through the filter, and so retain to the lymph its virulence, all extraneous germs will be kept back.

The method of inoculation most favoured in Australia—and seeing that it is almost uniformly successful, it will not be necessary to discuss any other—is that by which a short woollen thread previously soaked in the lymph is introduced, stitch-like, under the skin at the tip of the tail by means of a flattened needle, and there allowed to remain. Care should be taken that the tail-tip is clean, and that no dirt or septic matter is introduced. The stitch, *i.e.*, the distance from the point of insertion of the needle to its point of exit, should be from half to three-quarters of an inch, and no deeper than to cause a slight oozing of blood serum. If the needle is allowed to scrape or injure the bone, sloughing of the tail-tip will often ensue.

The first visible effect of inoculation is the formation in about ten days' time of a swelling, which gradually becomes pear-shaped, and may extend some distance up the tail, even to its root. At the same time there is slight febrile disturbance of the system, but otherwise no ill effects are observed. In cases where the inoculation "takes" severely, the inflammatory swelling will be intense, and sometimes the tail, or portion of it, will become gangrenous, and slough off. Sometimes the swelling extends to the rump and quarters, and by pressure upon the evacuatory channels causes retentions of urine and fæces, and death from uræmic poisoning. Ordinarily, the swelling commences to subside at the end of three weeks, and thenceforward the animal is protected against pleuro-pneumonia for a considerable time—a year at least—during which time it is also proof against re-inoculation.

IMMUNITY against the disease may also be naturally acquired. An animal recovered from an attack has acquired an immunity against subsequent attack, which lasts for a lengthened period, and may continue during life.

CULTIVATION OF LYMPH.—Pleuro-pneumonia lymph may be artificially cultivated in calves, and this method of procuring a continuous supply of healthy and uncontaminated lymph is to be commended far before dependence on getting it from affected animals. In fact, its adoption would be essential in prosecuting a campaign for the eradication of the disease. The details of the method of artificial cultivation are intricate, and can only be effectively carried out in a properly equipped zoopathic institution, and by specially experienced veterinary scientists.

### ERADICATION.

Pleuro-pneumonia is an essentially eradicable disease. It has been got rid of from the British Isles and also from America, and both these countries have for years enjoyed freedom from the enormous financial losses which its presence entails. The history of the campaign against the disease in the latter country is interesting and encouraging for Australians. It affords evidence of the success that can be compelled by earnest administration of intelligently conceived measures, ably prosecuted by men whose scientific training and practical knowledge of disease processes familiarises them with the methods to be adopted for the suppression of contagion. The success of such methods is as much dependent on correct foundation knowledge of the disease to be dealt with as are the operations of the surgeon on his knowledge of anatomy, or as are modern engineering feats on mathematical and physical science; and it is only from men possessed of such knowledge—as were Salmon and Law, the American veterinary surgeons-in-chief—that success can be reasonably expected. Another absolutely indispensable condition is that the conception and control of any suppressive scheme should be in the hands of a central authority, which could enforce its measures uniformly throughout the length and breadth of the continent, independent of State boundaries. Disease recognises no artificial boundaries, such as exist between the Australian States, and it would be useless for one State to attempt suppression without simultaneous action in each of the other States in which the disease exists. Granted that one State rid itself of the disease, the continuous expense of protecting it on the borders against reincursion of disease would be enormous. It was the futility of independent State efforts that precipitated the successful federal action in America. In 1887 the National and State Governments, being alarmed at pleuro-pneumonia infection having reached Chicago, the largest cattle market in the world, the beginning of the attempt at extinction was seriously undertaken by the Federal Government. The veterinary staff of the Bureau of Animal Industry was organized for the work, and in three months the last acute case was disposed of in Chicago, and the threatened danger to the Continent through the Chicago stock yards removed. This success gave the key to the solution of the problem of eradication, and vigorous suppressive work was followed up in other centres, until early in 1892 the quarantine was raised, and the nation declared free from the disease, and it has remained free ever since. During the campaign 356,404 *post-mortem* examinations were made, and 1,605,721 cattle examined; compensation was paid for 21,961 head. The task was accomplished with an expenditure of under £375,000—a sum less than 5 per cent. of the value of the beef exported yearly; and, to institute an Australian comparison, a sum less than one-half the annual loss that Australia sustained during the twelve years following the introduction of the disease, and little more than one-half of Queensland's annual loss in the early nineties.

The cost of compensation for cattle destroyed would be proportionately less in Australia than America, for the Australian experience of inoculation has, as previously indicated, been such as to warrant the presumption that, with an intelligently-conceived and rigorously-administered scheme of inoculation as preliminary and auxiliary to the stamping-out process, the wholesale slaughtering that was carried out in America would not be necessary.

With such a brilliant object lesson as that of the United States, with its extensive area, its congested stock centres, and its numerous cattle markets, before us, it can scarcely be said that a similar task is not possible of accomplishment in Australia. Rather may the statement be confidently ventured that, controlled by a Federal Department, with the friendly assistance of the present State administrations, and conducted in such a way as to secure the co-operation and help of stock-owners instead of their antipathy, the work could be undertaken with reasonable prospects of success within five years.

# GARDEN NOTES.

*J. Cronin, Inspector Vegetation Diseases Acts.*

## The Erica.

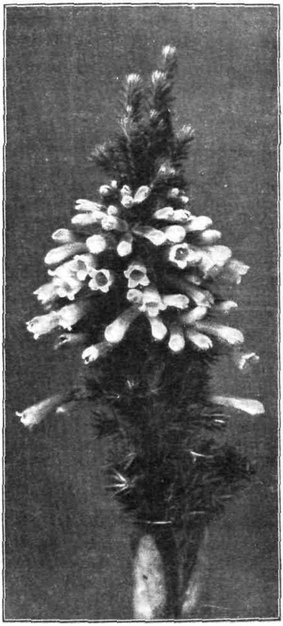
The erica, or heath, is a hard-wooded dwarf shrub, most of the species of which are natives of Cape Colony. A number of species are also found in Europe, and the allied species, *Calluna vulgaris*, the heather, and its numerous varieties or forms are natives of the British Islands. *Dabeocia* or *Menziesia polifolia*, commonly called here the Irish heath, is a distinct genus, while the so-called heaths of Australia belong to a different order, *Epacrideæ*. Heaths, especially those from South Africa, are a beautiful class of plants, and the hybridist has added to their beauty and variety. Most of the species are low-growing shrubs, many not exceeding a height of 6 inches; the majority of the garden varieties attain a height of from 2 to 4 feet. *Erica arborea*, the tree heath, is the tallest of the genus, attaining a height of 8 or 10 feet. This heath is a native of South Europe, and its wood is used in making so-called briar smoking pipes, the term briar being a corruption of the French word Bruyère, meaning heath.

Most of the species and varieties of ericas are hardy in this State, inasmuch as they can be grown in the gardens without special protection when well established. Under suitable conditions, they thrive and make fine, free-blooming plants. In the sandy, peaty soil in the Brighton district, they are at home, growing splendidly in many gardens, with practically no attention when once established. A bed of heaths, if the kinds are well chosen, will, at no season of the year, be devoid of bloom, while the plants are neat in growth and evergreen. The flowers of many kinds are beautiful, and wax-like in general appearance, some with long, tubular, drooping flowers arranged on spikes, others smaller, bell-like flowers, arranged in clusters or bunches. The colours are clear and pure, and the flowers last well when cut.

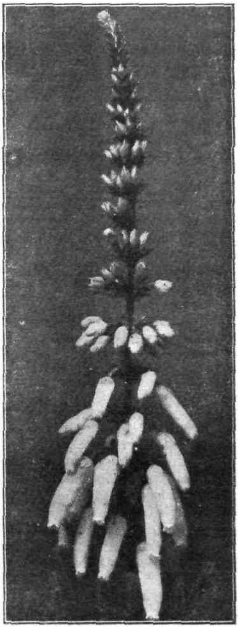
### SOIL AND CULTURE.

The most suitable soil for heaths of all classes is a sandy peat. In ordinary loams, even if rather heavy, many of the larger growing varieties

will succeed; but, as a class, they resent manures of all kinds, and whether the soil is sandy or otherwise, they are not likely to grow satisfactorily unless planted in virgin soil. The addition of sand or peat would be decidedly beneficial in heavy soils. In any of the country districts where the soil is of a sandy nature, heaths would succeed if protected from hot and severe winds. In many of the florists' gardens, near Melbourne,



ERICA WILMOREANA, PINK AND WHITE.



ERICA INTERMEDIA, WHITE.

they are grown under most trying conditions; often they are never watered artificially, the only attention given them being an occasional cleaning, and cutting the flowers, and yet they continue to thrive. The most important points in the preparation of a bed, or a position, for heaths are —that no stable manure, bone dust, &c., be used, and that the soil is perfectly drained. Spring and autumn are the most suitable periods for

planting, the plants having a chance of becoming in some slight degree established before the stress of extreme heat or cold arrives. The soil should be firmly pressed before the plants are set out, to prevent any sinking of the surface. Heaths are surface-rooting plants, and this must be borne in mind when planting, for, if planted too deeply, they would probably fail to grow. After cultivation should be watering thoroughly when necessary, and keeping the soil free from weeds. Care should be taken to prevent damage to roots when cultivating near heaths, only the lightest possible skimming, or indeed hand-weeding, being advisable. The only pruning needed is to stop, or thin-out shoots, so that well-balanced plants will be produced. In large established plants, cutting the flowers is practically all the pruning required, removing large or small pieces of growth according to the need of thinning or shortening growths to maintain the symmetry of the specimen.

### VARIETIES.

What are known as the Webbley varieties are among the very best. They are hybrids, raised at Malvern, Victoria, and have become popular for cutting on account of their freedom of flowering and beautiful pink shades of colour. The best are:—"Webbleyana," "W. superba," "Charsleyana," "McKinnoniana," "and "Jubilee." "Intermedia," a pure white, completes a fine set. *Bowieana* (white) and *mammosa* (purple) are also in the same style, and worthy of culture. *Ventricosa* is a beautiful species, of which there are several varieties, the best being *ventricosa magnifica*, *v. superba*, and *v. grandiflora*. These are dwarf in growth, flowering in late spring, of varying shades of pink. Other desirable kinds are:—"Cavendishiana" and "Beaconsfieldiana," yellow; "Wilmoreana," pink and white; "Hybrida," red; *persoluta alba*, white; "Baccans," pink (tall grower); *rubens*, bright rose; and *Cerinthoides coronata*, scarlet (long, tubular flowers).

## Flower Garden.

Roses and other plants were more generally infested by aphides last autumn than is usually the case. The winter being mild, a great number of the hibernating insects may be assumed to have survived, and a severe attack on the young growths may be expected. Healthy plants and fine flowers cannot be obtained while myriads of parasitic insects are robbing the plants of their vital forces. The safest and best medium to employ against such insects is tobacco in some form. The best prepared form is "Nikoteen." Tobacco wash prepared from leaf or waste tobacco should not be boiled, as is usual, or the valuable insecticidal properties will be lost. An infusion should be made; cover the tobacco with boiling water, and cover the vessel. The addition of soap at rate of 1 lb. to 5 gallons of water will add to its value as an insecticide directly, and secure its adherence to the insects. A most thorough spraying is necessary, making certain that all parts of the plants are reached. Mildew is also likely to be plentiful on roses, and should be prevented by early use of flowers of sulphur, or spraying with sulphide of potassium, 3 ozs. in 10 gallons of water. The latter may be mixed and applied with the soap and tobacco wash. As growths on roses and other plants are developing, any that are superfluous or badly placed should be removed. By so doing early, the energies of the plant are conserved and directed to the well-placed and required shoots.

Seeds of dahlias and other tender or half-hardy plants may be sown in the open ground, or in boxes, after the danger of being cut back by frost is past. In cold and late districts, it will be advisable to raise such plants in boxes or frames covered with glass, so that an early start may be secured. Dahlias, for instance, require a fairly long season of growth from seed, compared with plants produced from divisions of the crowns, and may not bloom the first season in such districts as Macedon if some early-forcing method is not followed. In the metropolitan district, plants raised from seed sown in beds at the beginning of October are ready to plant out during November, and will flower during March and April. The seed should be sown thinly in well pulverized soil, and covered lightly with sifted soil. If slugs or snails are present, they will destroy the young plants unless prevented. A ring of soot is all that is used as a preventive in many places. Beds previously prepared for the reception of chrysanthemums grown for exhibition blooms should be dug again, and manure added to the soil if necessary. The best time to plant for production of large blooms is October, early or late according to district and variety. Chrysanthemums grown for border decoration may be planted in September

### Kitchen Garden.

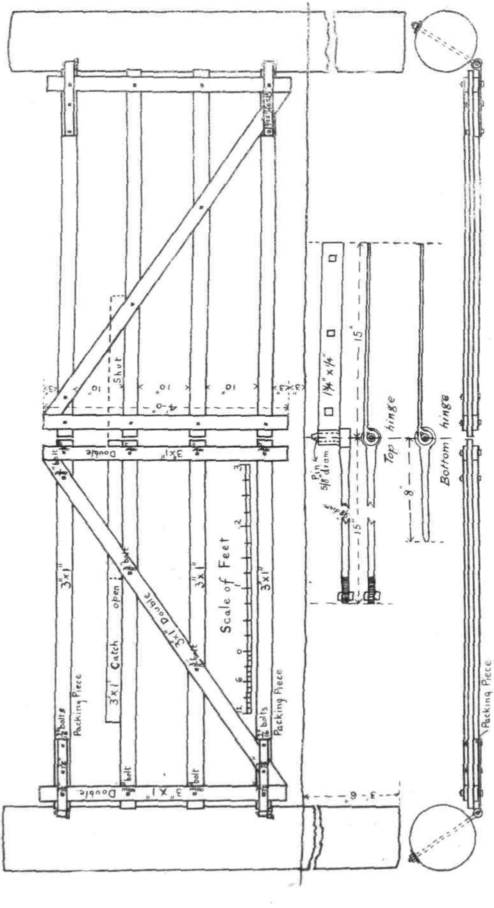
Preparing soil that has been roughly exposed during winter for the reception of seeds and plants from former sowings; breaking down soil for the summer, water-conserving, even surface, and thinning, hoeing, and weeding growing crops, constitute the bulk of the work during the month. Sowings may be made for succession of seed of broad beans and peas, also carrot, parsnip, cabbage, cauliflower, beet, and other crops for summer use. Plants from former sowings may be transplanted. Potatoes may be planted, as also early tomatoes, at end of month.

## A SERVICEABLE GATE.

*A. S. Kenyon, Engineer for Agriculture.*

The most unsatisfactory thing about most farms are the gates. Rarely do they appear to be in good order or working satisfactorily. Ranging from the Mallee lightning gate of one-barbed wire and a stake to the most elaborate mortice-framed iron-stayed structure, it is generally a bother when driving to open or shut them. Defective design, both in undue weight and in framing, is, as a rule, responsible for this state of things. Lightness and stiffness are the essentials, and, leaving out the iron gates now coming into general use, but beyond the ordinary farmer's ability to make, there is none better than the double-batten gate. It is no novelty, having been often described and long in use. There are, however, some points where improvement can be made, and these are incorporated in the drawing herewith. In a gate there are rails, angle braces, and stiles; the stiles to which the hinges are attached are termed hanging stiles, and those with the catch falling stiles. The materials for one pair of 3 in. x 1 in. double-batten gates for an opening of 12 feet are:—

8 rails, 3 in. x 1 in. and 6 ft. long—48 ft.
8 stiles, 3 in. x 1 in. and 4 ft. long—32 ft.
4 angle braces, 3 in. x 1 in. and 6 ft. 6 in. long—26 ft.


Scale of Feet
Packing Piece
Packing Piece
Packing Piece
Top hinge
Bottom hinge
Catch
open
Shut
Double

1 catch, 3 in. x 1 in. and 4 ft. 6 in. long—4 ft. 6 in.
4 packing pieces, say, 3 ft. 6 in.
  Total 114 running feet, 3 in. x 1 in. hardwood.
4 pairs hinges and gudgeons, as shown.
4 cuphead square-shoulder bolts, 7-16 in. x $3\frac{1}{4}$ wood length.
8 cuphead square-shoulder bolts, 7-16 in. x $2\frac{1}{4}$ wood length.
18 cuphead square-shoulder bolts, ⅜ in. x 3 in. wood length.
  All with nuts and washers.

The method of construction is of the simplest. Lay two stiles, hanging and falling, on the ground at the proper distance apart and square; lay the angle brace so that it comes to the ends of stiles; mark it and cut several, as many as required; lay it between the stiles; place the rails in position, as many as desired, and projecting beyond the stiles at each end, and on top of them lay the remaining stiles and the angle brace. A nail or two will hold them in position while holes are bored through for the bolts, and the latter inserted and screwed up. A pair of gates should not occupy in making much over one hour. If many are wanted, a frame should be made and set on the ground, for convenience and saving of time. The points to be borne in mind are to keep the bolt holes as far as possible from the ends of the battens to avoid risk of splitting. This is done by carrying the angle braces to the ends of the stiles, and not to the crossing of the rails and stiles as usual, and by extending the rails beyond the stiles at each end. If the farmer is the proud possessor of a forge and stock and dies, he can make the ironwork for himself. If not, recourse must be had to the local blacksmith. The cost, however, should not exceed about seven shillings for the two pairs of hinges.

In erecting, the gates should be hung to posts independently of the fence. A gate post with wire strained to it will never prove satisfactory. Between the posts a sill log should be set, chocked into each post and just at or a little below the surface of the ground. It serves to keep the posts fixed in position, and is necessary if it is intended to wire-net the gate against rabbits. The gudgeons should be so put in that the gates swing back clear of the posts, leaving the latter to stand any collisions with waggons or implements, which they are better fitted to do than the light gates. The catch consists simply of a piece of 3 in. x 1 in. batten, sufficiently long to extend from one angle brace to the other, between them and the double stiles, and resting on one of the rails. This catch stiffens up the gate so that it is practically one panel. More or less rails may be put in. If fewer than shown, wire-netting stretched over the gate makes it proof against sheep. In positions where the work is light, the top and bottom rails only, with wire-netting between, will be sufficient. Soft wood is, on the whole, preferable to hard wood, as it is about as strong and is considerably lighter. The gates shown weigh about 70 lbs. each in hardwood, and about 50 lbs. in soft wood. The projecting ends of the rails at the falling stiles give room for adjustment when hanging. By the aid of a handsaw they may be made come together as closely as desired, even if the gates are not hung quite true. Never put the angle braces running down from the hanging to the falling stiles; always place them as shown in the drawing. Keep the gates screwed up—once a year at first, and less frequently afterwards. Do not strain wire to your gate posts and expect the gates to hang true. Gates are better painted both to preserve them and for the more ready identification at night time. Cold water paint, Washington whitewash, &c., are better than nothing.

# THE ORCHARD.

*James Lang, Harcourt.*

Orchardists will find this an unusually busy month in getting the orchard into trim, and attending to spraying where required. As pruning and planting are now finished, a start should be made as early as possible with the ploughing of the orchard, which should be continued steadily until completed, while the soil is in a moist condition. If left later, the ground rapidly becomes hard and dry, especially in the drier districts, so that ploughing becomes difficult, and puts a severe strain on the horses. Once the ground has been turned over in the early spring it is always an easy matter to keep it in good condition throughout the summer. Where peas have been sown in the orchard for green manure, it is very necessary that they should be ploughed in while the ground is in a moist condition. Roll them down with a heavy roller; fix a revolving coulter to the plough, and plough in the same way as they have been rolled. Do not roll more than can be ploughed during the day, as the peas will rise again by the next morning, and it is then difficult to roll them flat again. Where it is intended to manure the orchard, a dressing of from 4 to 5 cwt. per acre of orchard manure should be given before ploughing.

Grafting should be done this month. Where old trees are being re-grafted consideration should be given to those varieties suitable for export to oversea markets, because the orchardist will have to depend more and more every year on the export trade to provide a profitable outlet for his surplus fruit. Every opportunity should therefore be taken to increase the quantity of fruit available for export by re-grafting old trees with suitable varieties.

Peach trees will require constant attention to keep the aphis under by spraying with tobacco wash or kerosene emulsion whenever it makes its appearance. Apricots, too, will require spraying with the Bordeaux mixture to destroy the shot-hole fungus. This is best done when the bloom has fallen, and before the leaves shoot out. Apple and pear trees will also require attention towards the end of the month in spraying for the scab (*fusicladium dentriticum*) with the Bordeaux mixture; this should not be neglected in those districts which are affected with this fungus, especially should the spring turn out to be warm and moist, as it is under these conditions that the disease spreads rapidly unless kept in check.

A preventive for bitter pit in apples has so far baffled all our scientific observers in the different States. This is to be regretted, as the disease is going to be a serious trouble to shippers of apples. The fruit is perfectly clean when gathered and packed, but during transit it develops bitter pit, which detracts very much from the value of the fruit when sold. The apples which are shipped early in the season develop the disease much more than those shipped later. Is it because the later shipments are better matured than the earlier ones? All kinds of citrus fruits may now be planted out. Head the plants well back, and secure them to a stake to prevent the wind from blowing them about.